A

KEY

TO THE

INTRODUCTION

TO THE

NATIONAL ARITHMETIC,

EXHIBITING THE OPERATION OF

THE MORE DIFFICULT EXAMPLES

IN THAT WORK;

FOR THE USE OF TEACHERS ONLY.

By BENJAMIN GREENLEAF, A.M.
PRINCIPAL OF BRADFORD TEACHERS' SEMINARY.

NEW STEREOTYPE EDITION.

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1860.

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☞ Two editions of the NATIONAL ARITHMETIC, and also of the COMMON SCHOOL ARITHMETIC, one containing the ANSWERS to the examples, and the other without them, are published. Teachers are requested to state in their orders *which edition* they prefer.

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PREFACE.

THE object of the author, in this publication, is to aid the teacher in communicating instruction to his pupils, and in detecting any error which they may have made in the operation of the examples.

Every instructor, who has a large number of scholars under his care, is aware that it is a great tax on his time, especially when in school, to examine the operation of many arithmetical questions; whereas, by the aid of a Key, he may readily detect any mistake in the operation. Besides, amid the labors of the school-room, it is often very difficult for the most able arithmetician to recollect, at the moment, all the principles involved in the solution of difficult questions; but, by recurring to a Key, this difficulty will be obviated.

The author would recommend to teachers never to point out *directly* to the pupil the method of solving a problem, nor perform the labor for him, but suggest and explain such principles as will enable him to perform the question himself.

The answers to all the examples in the Arithmetic are inserted in the Key, for the convenience of those teachers who may prefer to use the edition of the Arithmetic which does not contain the answers.

B. GREENLEAF.

Bradford, Mass., Feb. 16, 1857.

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KEY

TO

GREENLEAF'S INTRODUCTION.

NOTATION AND NUMERATION.

Roman Notation.

2.	(Art. 3, p. 9.) LXXXVII.	6.	DXLII.
3.	CX.	7.	MCCCXIX.
4.	CLXIX.	8.	MDCCCLVIII.
5.	CCLXXV.		

French Notation and Numeration.

1.	(Art. 13, p. 13.) 47	10.	408,096
2.	359	11.	5,402
3.	6,575	12.	907,805,074
4.	908	13.	347,915
5.	19,000	14.	89,047
6.	1,504	15.	51,081
7.	27,000,500	16.	7,395
8.	99,099	17.	57,059,099,047
9.	42,002,005		

English Notation and Numeration.

1.	(Art. 16, p. 15.)	325,412
2.		214,165; 078,056
3.		42; 617,031; 041,342
4.		2,008; 009,082; 701,908

ADDITION.

3.	(Art. **20**, p. **19**.)	978	7.	698
4.		889	8.	999
5.		998	9.	439
6.		669	10.	868
10.	(Art. **23**, p. **21**.)	3555	35.	694764
11.		3212	36.	156800
12.		1922	37.	1802790
13.		3175	38.	76833457
14.		27891	39.	1111110
15.		289436	40.	9323
16.		354409	41.	7693486
17.		347514	42.	3155917
18.		382898	43.	2643
19.		26027511	44.	1039
20.		1366855	45.	227934
21.		6908906	46.	63315
22.		142885	47.	2373544
23.		21616	48.	8272 dollars.
24.		766503	49.	131 trees.
25.		13814	50.	1563 pounds.
26.		969754	51.	2103 dollars.
27.		11720	52.	2257 dollars.
28.		31622	53.	500 dollars.
29.		949661	54.	9115 dollars.
30.		86578	55.	2728116
31.		539658	56.	6624988
32.		57372	57.	3952837
33.		848340	58.	3321317
34.		1000779	59.	6564818
2.	(Art. **24**, p. **24**.)	95947	5.	113378
3.		102201	6.	86621
4.		100536		

SUBTRACTION.

8.	(ART. 32, p. 30.) 47896	25.	799690466
9.	265899	26.	24974975
10.	587544	27.	89901
11.	377778	28.	90909091
12.	9393239896470	29.	999991
13.	1	30.	2967
14.	471112	31.	99995000
15.	981012	32.	767 dollars.
16.	1	33.	39 years.
17.	9998392	34.	105 years.
18.	6097700810072	35	4731
19.	7977100909213	36.	6122423 inhabitants.
20.	7100061569937	37.	16817082 bushels.
21.	500710920089	38.	2246193 bushels.
22.	1	39.	6181001 dollars.
23.	455555556	40.	577904
24.	8753086431	41.	49841021 miles.

2. (ART. 33, p. 32.) 2588 acres. | 3. 3528 dollars.

MULTIPLICATION.

9.	(ART. 36, p. 36.) 6910677	14.	50246229
10.	7012310120	15.	60725 dollars.
11.	53580296	16.	228456 dollars.
12.	24881935	17.	27918 letters.
13.	105185376		

	(ART. 40, p. 39.)	12.	10989 dollars.
8.	611 dollars.	13.	13505 miles.
9.	2813 dollars.	14.	8760 hours.
10.	35599 dollars.	15.	5481 gallons.
11.	1853654 dollars.	16.	200451 dollars.

17.	68816 pounds.	26.	582088
18.	321300	27.	3831635
19.	518077	28.	1462126
20.	881919	29.	264640056
21.	9691836	30.	99070437
22.	18219071	31.	826888542
23.	70287492	32.	290355807
24.	153288487686	33.	721361144
25.	49062139937803	34.	8798979491

2.	(ART. 42, p. 41.) 765325	6.	2851200 inches.
3.	123396	7.	631152 hours.
4.	611226	8.	68520 feet.
5.	987625		

2.	(ART. 43, p. 42.) 23560	4.	7964000
3.	587300	5.	9872500000

	(ART. 44, p. 43.)	10.	910089999000
4.	72103581726300	11.	24010024010000
5.	490154012100000000	12.	400400800400400
6.	28522743249000	13.	1224241200000
7.	4179911100000	14.	14122412100
8.	11717175236000	15.	18000220000
9.	69660900000000	16.	1100022000000

DIVISION.

	Quotients.	Rem.		Quotients.	Rem.
5.	(ART. 50, p. 48.) 757913	0	15.	186529	6
6.	1460898	1	16.	958131	11
7.	141090	5	17.	1135791	1
8.	47316	4	18.	162255	6
9.	994864	8	19.	202818	6
10.	698082	1	20.	225353	3
11.	528776	9	21.	187794	2
12.	79992	4	22.	170721	9
13.	55096	6	23.	78715 dollars.	
14.	54848	5	24	17167 acres.	

25. 876451 dollars.
26. 14888 dollars.
27. 9589 bushels.
28. 99483 yards.
29. 109517 acres.
30. 371 dollars.
31. 1315

	Quotients.	Rem.
2. (ART. **51**, p. **50**.)	216	0
3.	89786	10
4.	13717421	0
5.	32534467	5

10. (ART. **54**, p. **52**.)	234	
11.	365	
12.	145	6
13.	7634	0
14.	5204	11
15.	290720	25
16.	68549	88
17.	240415	5
18.	15608	5
19.	129725	66
20.	144927	36
21.	14703	55
22.	1919	55
23.	912	30
24.	3502319	714
25.	26080418	234
26.	11058232	277
27.	5502	95
28.	9755	4060
29.	3453	7122
30.	30003	0
31.	26750	962
32.	86268755	480
33.	8428688	22346
34.	62927	2295060
35.	1099	200210510
36.	476 dollars.	
37.	395 acres.	
38.	763 dollars.	
39.	345 bushels each	
40.	389 dollars.	
41.	1234 men.	
42.	$6538\frac{1279}{4587}$ dollars.	

2. (ART. **55**, p. **54**.)	30613	
3.	1469	
4.	7546	
5.	7901	
6.	182	
7.	264	

3. (ART. **56**, p. **55**.)	54	
4.	20	
5.	77	
6.	405	

	Quotients.	Rem.
2. (ART. **57**, p. **56**.)	689	2
3.	43	75
4.	24	815
5.	9876	54321123

(ART. 59, p. 57.)

	Quotients.	Rem.
2.	44	74
3.	332	192
4.	667	253
5.	1473	2597
6.	102	497654325
7.	3491706185	306787
8.	948266	411328000
9.	20729	5115000
10.	18191	618562300
11.	85	44916000000

CONTRACTIONS IN MULTIPLICATION.

(ART. 61, p. 62.)

2. 1914741450
3. 14197467925
4. 3086419725

(ART. 62, p. 62.)

2. 11892984700
3. 29037739400
4. 19454930400

(ART. 63, p. 62.)

2. 995665625
3. 154320875
4. 381232750

(ART. 64, p. 63.)

2. 1233332433
3. 876542123457
4. 999998000001

CONTRACTIONS IN DIVISION.

2. (ART. 65, p. 63.) 395061
3. 55157
4. $35999\frac{28}{100}$

(ART. 66, p. 64.)

2. $29629629\frac{63}{100}$
3. $261371\frac{34}{100}$
4. $143686\frac{8}{100}$
5. $2690\frac{28}{100}$
6. $535\frac{62}{100}$

2. (ART. 67, p. 64.) 13825
3. 3830106
4. 4729879
5. $3917\frac{184}{1000}$
6. $6689\frac{472}{1000}$

MISCELLANEOUS EXAMPLES.

1. (p. 65.) 584 dollars.
2. 25088 dollars.
3. 940 cents.
4. 1530 cents.
5. 873 dollars.
6. 4257 cents.

7.	2106 miles.	27.	25
8.	61 miles.	28.	135442
9.	35405 dollars.	29.	144 feet.
10.	42884 dollars.	30.	123040 rods.
11.	7665 dollars.	31.	630 dollars.
12.	37 dollars.	32.	187 dollars.
13.	47 dollars.	33.	1188 dollars.
14.	1368 hours.	34.	413 dollars.
15.	5904 ounces.	35.	5430 dollars.
16.	56960 acres.	36.	457 dollars.
17.	234 dollars.	37.	Loss, 3 dollars.
18.	3178 dollars.	38.	Gain, 22 dollars.
19.	7581 dollars.	39.	The land, by 5136 dollars.
20	Gain, 1488 cents.	40.	543 dollars.
21.	576 dollars.	41.	635 dollars.
22.	20 dollars.	42.	743 dollars.
23.	255 dollars.	43.	1828 dollars.
24.	3520	44.	133 dollars.
25.	1607	45.	27 dollars.
26.	5676	46.	533 dollars.

UNITED STATES MONEY.

(ART. 71, p. 71.)

1.	12500 cents.	5.	$ 41.23
2.	345000 mills.	6.	15629 cents.
3.	$ 0.297	7.	16428 mills.
4.	$ 2.682	8.	9870 mills.

ADDITION.

(ART. 72, p. 72.)

		10.	$ 13.87 0
		11.	$ 31.64 0
5.	$ 4408.88 8	12.	$ 21.62 0
6.	$ 410.46 9	13.	$ 3.42 5
7.	$ 448.36 8	14.	$ 15.00 0
8.	$ 4713.78 6	15.	$ 48.32 0
9.	$ 31.61 0	16.	$ 48.46 0

Subtraction.

5.	(Art. 73, p. 73.) $ 52.66 4	10.	$ 82.83 0
6.	$ 71.97 6	11.	$ 26.58 0
7.	$ 724.89 8	12.	$ 9.99 1
8.	$ 782.20 6	13.	$ 14.74 0
9.	$ 65.98 0	14.	$ 34.67 1

Multiplication.

3.	(Art. 74, p. 74.) $ 44.55 0	9.	$ 672.01
4.	$ 414.64 0	10.	$ 106.97
5.	$ 7.31 0	11.	$ 450.00
6.	$ 30.87 5	12.	$ 1600.50
7.	$ 1774.25 0	13.	$ 24327.96
8.	$ 85.50		

Division.

3.	(Art. 75, p. 75.) $ 137.37	9.	$ 0.93
4.	$ 5.63	10.	$ 3.28
5.	$ 20.00	11.	$ 11.67
6.	$ 0.59	12.	$ 4.68
7.	$ 5.68	13.	$ 132.55
8.	$ 0.13	14.	$ 5.75

Practical Questions by Analysis.

2.	(Art. 77, p. 76.) $ 90.21	6.	$ 68.40
3.	$ 29.70	7.	$ 5525.28
4.	$ 42.21	8.	$ 737.64
5.	$ 728.19		

10. (Art. 78, p. 77.) $ 422.50 ÷ 65 = $ 6.50; $ 650 × 15 = $ 97.50 Ans.
11. $ 2025 ÷ 45 = $ 45; $ 45 × 180 = $ 8100 Ans.
12. $ 3.45 ÷ 5 = $ 0.69; $ 0.69 × 11 = $ 7.59 Ans.
13. $ 214.50 ÷ 11 = $ 19.50; $ 19.50 × 87 = $ 1696.50 Ans
14. $ 60.00 ÷ 8 = $ 7.50; $ 7.50 × 87 = $ 652.50 Ans.
15. $ 5.58 ÷ 9 = $ 0.62; $ 0.62 × 43 = $ 26.66 Ans.
16. $ 85 ÷ 5 = $ 17; $ 17 × 97 = $ 1649 Ans.

17. $3.80 ÷ 20 = $0.19; $0.19 × 59 = $11.21 Ans.
18. $472.50 ÷ 27 = $17.50; $17.50 × 12 = $210 Ans.
19. $39.69 ÷ 7 = $5.67; $5.67 × 57 = $323.19 Ans.
20. $10.08 ÷ 144 = $0.07; $0.07 × 359 = $25.13 Ans.
21. $77.13 ÷ 857 = $0.09; $0.09 × 359 = $32.31 Ans.
22. $187.53 ÷ 987 = $0.19; $0.19 × 329 = $62.51 Ans.
23. $26.32 ÷ 47 = $0.56; $0.56 × 39 = $21.84 Ans.

25. (ART. **79**, p. **78**.) 175 ÷ 5 = 35 reams, Ans.
26. 217.50 ÷ 7.50 = 29 barrels, Ans.
27. 4875 ÷ 75 = 65 tons, Ans.
28. 1728 ÷ 4 = 432 yards, Ans.
29. 9.66 ÷ 0.69 = 14 hundred weight, Ans.
30. 66.51 ÷ 7.39 = 9 barrels, Ans.
31. 136.50 ÷ 3.25 = 42 cords, Ans.

BILLS.

(ART. **80**, p. **79**.)

(1.) J. Smith.

$0.75 × 82 =	$61.50
0.92 × 89 =	81.88
0.50 × 24 =	12.00
	$155.38

(2.) L. Webster.

$0.18 × 6 =	$1.08
0.20 × 12 =	2.40
1.80 × 6 =	10.80
0.26 × 30 =	7.80
	$22.08

(3.) W. Greenleaf.

$0.50 × 86 =	$43.00
0.86 × 90 =	77.40
11.00 × 18 =	198.00
3.50 × 23 =	80.50
0.62 × 14 =	8.68
12.12 × 12 =	145.44
12.00 × 46 =	552.00
	$1105.02

(4.) A. Dow.

$23.75 × 37 =	$878.75
17.50 × 42 =	735.00
99.00 × 43 =	4257.00
175.00 × 12 =	2100.00
7.00 × 19 =	133.00
1.52 × 23 =	34.96
	$8138.71

(5.)

Dr. John Wade		To Ayer, Fitts, & Co. Cr.	
$1.20 × 80 =	$ 96.00	$0.20 × 27 =	$ 5.40
3.00 × 17 =	51.00	3.90 × 10 =	39.00
1.08 × 19 =	20.52	4.75 × 7 =	33.25
0.75 × 23 =	17.25	2.93 × 19 =	55.67
	$ 184.77	0.37 × 20 =	7.40
			$ 140.72
	$ 184.77		
	140.72		
Balance due,	$ 44.05		

(ART. 81, p. 81.)

1. $ 254.27
2. $ 338.36
3. $ 1995.52
4. $ 19411.14

REDUCTION.

(ART. 86, p. 84.)

(3.)

9£. 18s. 7d.
20
198s.
12
2383d. Ans.

(4.)

12)2383d.
20)198s. 7d.
Ans. 9£. 18s. 7d.

(5.)

14£. 11s. 5d. 2far.
20
291s.
12
3497d.
4
13990far. Ans.

(6.)

4)13990far.
12)3497d. 2far.
20)291s. 5d.
Ans. 14£. 11s. 5d. 2far.

(ART. 87, p. 86.)

(3.)

76pwt. 12gr.
24
306
153
Ans. 1836gr.

(4.)

24)1836gr.
Ans. 76pwt. 12gr.

(5.)

76lb. 5oz.
12
917oz.
20
18340pwt.
24
Ans. 440160gr.

(6.)

24)440160gr.
20)18340pwt.
12)917oz.
Ans. 76lb. 5oz.

(7.)

144lb. 9oz.
12
1737oz.
20
Ans. 34740pwt.

(8.)

20)34740pwt.
12)1737oz.
Ans. 144lb. 9oz.

(9.)

24)17895gr.
20)745pwt. 15gr.
12)37oz. 5pwt.
Ans. 3lb. 1oz. [5pwt. 15gr.

(10.)

3lb. 1oz. 5pwt. 15gr.
12
37oz.
20
745pwt.
24
Ans. 17895gr.

(11.)

2oz. 18pwt. 12gr.
20
58pwt.
24
1404gr.
1.37
Ans. $1923.48

(ART. 88, p. 87.)

(3.)

76℔
12
912ʒ
8
7296ʒ
3
21888ℨ Ans.

(4.)

3)21888ℨ
8)7296ʒ
12)912ʒ
Ans. 76℔

(5.)

144℔
12
1728ʒ
8
13824ʒ
3
41472ℨ
20
Ans. 829440gr.

(6.)

20)829440gr.
3)41472ℨ
8)13824ʒ
12)1728ʒ
Ans. 144℔

(7.)

12℔ 8℥ 3℥ 1℈ 18gr.
12
152℥
8
1219℥
3
3658℈
20
73178gr. Ans.

(8.)

20)73178gr.
3)3658℈ 18gr.
8)1219℥ 1℈
12)152℥ 3℥
Ans. 12℔ 8℥
[3℥ 1℈ 18gr.

(9.)

7℥ 6℥ 2℈
8
62℥
3
Ans. 188 doses.

(Art. 89, p. 89.)

(3.) 16T. 19cwt. 0qr. 10lb. 11oz. 5dr.
20
339
4
1356
25
6780
2713
33910
16
203461
33911
542571
16
3255431
542571
8681141

(4.) 16)8681141dr.
16)542571oz. 5dr.
25)33910lb. 11oz.
4)1356qr. 10lb.
20)339cwt. 0qr.
16T. 19cwt. 0qr. 10lb. 11oz. 5dr.

(5.) 679cwt.
4
2716qr.
25
13580
5432
67900lb. Ans.

(6.) 25)67900lb.
4)2716qr.
679cwt. Ans.

(7.)

17cwt. 0qr. 18lb
4
71qr.
25
363
143
1793lb.
.07
$125.51 Ans.

(8.)

48T. 17cwt.
20
977cwt.
4
3908qr.
25
19540
7816
97700lb.
.08
$7816.00 Ans.

(ART. 90, p. 90.)

(3.)

144yd. 3qr.
4
Ans. 579qr.

(4.)

4)579qr.
Ans. 144yd. 3qr.

(5.)

17 E. E. 4qr. 3na.
5
89qr.
4
Ans. 359na.

(6.)

4)359na.
5)89qr. 3na.
Ans. 17 E. E. 4qr. 3na.

(7.)

126yd. 0qr. 3na.
4
504qr.
4
Ans. 2019na.

(8.)

4)2019na.
4)504qr. 3na.
Ans. 126yd. 0qr. 3na.

(9.)

49yd. 3qr.
4
199qr.
2.17
Ans. $ 431.83

(10.)

144yd. 1qr. 3na.
4
577qr.
4
2311na.
.25
Ans. $ 577.75

(Art. 91, p. 92.)

(3.)

47m.
8
376fur.
40
15040rd.
16½
Ans. 248160ft.

(4.)

16½)248160ft.
40)15040rd.
8)376fur.
Ans. 47m.

(5.) 78deg. 50m. 7fu. 30rd. 5yd. 2ft. 10in.

69⅛
752
468
13
5445
8
43567
40
1742710
5½
8713555
871355
9584910
3
28754732
12
345056794

(6.)

12)345056794in.
3)28754732ft. 10in.
5½)9584910yd. 2ft.
40)1742710rd. 5yd.
8)43567fur. 30rd.
69⅛)5445m. 7fur.
78deg. 50m. 7fur. 30rd. 5yd. 2ft. 10in.

(ART. **92**, p. **93**.)

(3.)
80)4386cha.
Ans. 54m. 66cha.

(4.)
54m. 66cha.
80
Ans. 4386cha.

(5.)
75m. 49cha.
80
6049cha.
4
Ans. 24196 poles.

(6.)
4)24196 poles.
80)6049cha.
Ans. 75m. 49cha.

(7.)
7m. 4fur. 30rd.
8
60fur.
40
2430rd.
25
Ans. 60750l.

(8.)
25)607501.
40)2430rd.
8)60fur. 30rd.
Ans. 7m. 4fur. 30rd.

(ART. **93**, p. **96**.)

(3.)
49A. 3R. 16p.
4
199R.
40
7976p.
272¼
Ans. 2171466ft.

(4.)
272¼)2171466ft.
40)7976p.
4)199R. 16p.
Ans. 49A. 3R. 16p.

(5.)
365A. 3R. 17p.
4
1463R.
40
58537p.
1.75
Ans. $102,439.75

(6.)
3A. 1R. 30p.
4
13R.
40
550p.
272¼
149737½ft.
1.25
Ans. $187171.875

(7.)

12m.
12
144 sq. m.
640
Ans. 92160A.

(8.)

18A. 0R. 16p.
4
72R.
40
2896p.
272¼
Ans. 788436 sq. ft.

(9.)

48A. 3R. 14p.
4
195R. $ 3.15
40 2.25
7814p. .90
.90
Ans. $ 7032.60

(ART. 94, p. 98.)

(3.)

45C.
128
5760ft.
1728
9953280 cu. in., Ans.

(4.)

1728)9953280 cu. in.
128)5760ft.
Ans. 45C.

(5.)

15ft.
4
60
6½
128)390 cu. ft.
Ans. 3C. 6ft.

(6.)

4ft.
8½
13
2
26 cu. ft.
1728
Ans. 44928 cu. in.

(7.)

14
12
168
8
Ans. 1344 cu. ft.

(8.)

40)9080ft.
227
11.50
$ 2610.50

(ART. **95**, p. **99**.)

(3.)

197 tuns 3hhd. 60gal. 3qt. 1pt.

4

791hhd.

63

49893gal.

4

199575qt.

2

399151pt.

4

Ans. 1596604gi.

(4.)

4)1596604gi.

2)399151pt.

4)199575qt. 1pt.

63)49893gal. 3qt.

4)791hhd. 60gal.

Ans. 197 tuns 3hhd. 60gal. [3qt. 1pt.

(5.)

7

63

441gal.

4

1764qt.

2

3528pt.

.05

Ans. $ 176.40

(6.)

18 tuns 1hhd. 47gal.

4

73hhd.

63

4646gal.

1.25

Ans. $ 5807.50

(ART. **96**, p. **100**.)

(3.)

4 tuns 1hhd. 17gal. 0qt. 1pt.

4

17hhd.

54

935gal.

4

3740qt.

2

7481pt. Ans.

(4.)

2)7481pt.

4)3740qt. 1pt.

54)935gal.

4)17hhd. 17gal.

Ans. 4 tuns 1hhd. 17gal. 0qt. 1pt.

(5.)

7hhd. 18gal.

54

396gal.

4

1584qt.

.04

$63.36 Ans.

(6.)

18

54

972gal.

.15

Ans. $145.80

(ART. 97, p. 101.)

(3.)
97ch. 30bu. 2pk.
36
3522bu.
4
14090pk.
8
112720qt. Ans.

(4.)
8)112720qt.
4)14090pk.
36)3522bu. 2pk.
Ans. 97ch. 30bu. [2pk.

(5.)
35bu. 0pk. 0qt. 1pt.
4
140pk.
8
1120qt.
2
2241pt. Ans.

(6.)
2)2241pt.
8)1120qt. 1pt.
4)140pk.
Ans. 35bu. 0pk. 0qt. 1pt.

(7.)
18qr. 0bu. 3pk. 5qt.
8
144bu.
4
579pk.
8
Ans. 4637qt.

(8.)
8)4637qt.
4)579pk. 5 qt.
8)144bu. 3pk.
Ans. 18qr. 0bu. 3pk. [5qt

(9.)
19bu. 3pk. 7qt. 1pt.
4
79pk.
8
639qt.
2
Ans. 1279pt.

(10.)
2)1279pt.
8)639qt. 1pt.
4)79pk. 7qt.
Ans. 19bu. 3pk. 7qt. 1pt.

(ART. 98, p. 104.)

(3.)
296da. 18h. 32m.
24
7122h.
60
Ans. 427352m.

(4.)
60)427352m.
24)7122h. 32m.
Ans. 296da. 18h. 32m.

(5.)

365da. 5h. 48m. 49sec.
24
8765h.
60
525948m.
60
31556929sec.
30
946707870
22699722
Ans. 969407592sec.

262da. 17h. 28m. 42sec.
24
6305h.
60
378328m.
60
22699722sec.

(6.)

365da. 5h. 48m. 49sec.
24
8765h.
60
525948m.
60
31556929 seconds in a solar year.

31556929)969407832(30 years.
946707870
60)22699722sec.
60)378328m. 42sec.
24)6305h. 28m.
262da. 17h.
Ans. 30y. 262da. 17h. 28m. 42sec

(7.)

60)684592m.
24)11409h. 52m.
7)475d. 9h.
Ans. 67w. 6d. 9h. 52m.

(8.)

67w. 6d. 9h. 52m.
7
475da.
24
11409h.
60
Ans. 684592m.

9.	189 days.	12.	275 days.
10.	425 days.	13.	366 days.
11.	43 days.	14.	1213 days.

(Art. **99**, p. **106**.)

(3.)

27S. 19° 51′ 28″
30
829°
60
49791′
60
Ans. 2987488″

(4.)

60)2987488″
60)49791′ 28″
30)829° 51′
Ans. 27S. 19° 51′ 28′

Miscellaneous Exercises.

1. (p. **107**.) 345 × 100 = 34500; 34500 + 18 = 34518; 34518 × 10 = 345180 mills, Ans.
2. 345180 mills ÷ 10 = 34518; 34518 ÷ 100 = $ 345.18, Ans.
3. 46 × 20 = 920s.; 920s. + 18s. = 938s.; 938 × 12 = 11256d.; 11256d. + 5d. = 11261d.; 11261 × 4 = 45044far. Ans.
4. 45044 ÷ 4 = 11261d.; 11261 ÷ 12 = 938s. 5d.; 938 ÷ 20 = 46£. 18s.; 46£. 18s. 5d. Ans.
5. 61 × 12 = 732oz.; 732 × 20 = 14640pwt.; 14640pwt. + 17pwt. = 14657pwt.; 14657 × 24 = 351768gr.; 351768gr. + 17gr. = 351785gr. Ans.
6. 351785gr. ÷ 24 = 14657pwt. 17gr.; 14657 ÷ 20 = 732oz. 17pwt.; 732 ÷ 12 = 61lb.; 61lb. 0oz. 17pwt. 17gr. Ans.
7. 27 × 12 = 324ʒ; 324ʒ + 3ʒ = 327ʒ; 327 × 8 = 2616ʒ; 2616ʒ + 1ʒ = 2617ʒ; 2617 × 3 = 7851ϑ; 7851ϑ + 1ϑ = 7852ϑ Ans.
8. 7852 ÷ 3 = 2617ʒ 1ϑ; 2617 ÷ 8 = 327ʒ 1ʒ; 327 ÷ 12 = 27℔ 3ʒ; 27℔ 3ʒ 1ʒ 1ϑ Ans.
9. 83 × 20 = 1660cwt.; 1660cwt. + 11cwt. = 1671cwt.; 1671 × 4 = 6684qr.; 6684qr. + 3qr. = 6687qr.; 6687 × 25 = 167175lb.; 167175lb. + 18lb. = 167193lb.; 167193 × 16 = 2675088oz. Ans.

10. 2675088 ÷ 16 = 167193lb.; 167193 ÷ 25 = 6687qr. 18lb.; 6687 ÷ 4 = 1671cwt. 3qr.; 1671 ÷ 20 = 83T. 11cwt.; 83T. 11cwt. 3qr. 18lb. Ans.
11. 97 × 4 = 388qr.; 388qr. + 3qr. = 391qr.; 391 × 4 = 1564na.; 1564na. + 3na. = 1567na. Ans.
12. 1567 ÷ 4 = 391qr. 3na.; 391 ÷ 4 = 97yd. 3qr.; 97yd. 3qr. 3na. Ans.
13. 57 × 5 = 285qr.; 285 ÷ 4 = 71yd. 1qr. Ans.
14. 71 × 4 = 284qr.; 284qr. + 1qr. = 285qr.; 285 ÷ 5 = 57 E. E. Ans.
15. 15 × 8 = 120fur.; 120fur. + 7fur. = 127fur.; 127 × 40 = 5080rd.; 5080rd. + 18rd. = 5098rd.; 5098 × $16\frac{1}{2}$ = 84117ft.; 84117ft. + 10ft. = 84127ft.; 84127 × 12 = 1009524in.; 1009524in. + 6in. = 1009530in. Ans.
16. 1009530 ÷ 12 = 84127ft. 6in.; 84127 ÷ $16\frac{1}{2}$ = 5098rd. 10ft.; 5098 ÷ 40 = 127fur. 18rd.; 127 ÷ 8 = 15m. 7fur.; 15m. 7fur. 18rd. 10ft. 6in. Ans.
17. 95000000 × 8 = 760000000fur.; 760000000 × 40 = 30400000000rd.; 30400000000 × $16\frac{1}{2}$ = 501600000000ft.; 501600000000 × 12 = 6019200000000in. Ans.
18. 6019200000000 ÷ 12 = 501600000000ft.; 501600000000 ÷ $16\frac{1}{2}$ = 30400000000rd.; 30400000000 ÷ 40 = 760000000fur.; 760000000 ÷ 8 = 95000000 miles, Ans.
19. 48 × $69\frac{1}{6}$ = 3320m.; 3320m. + 18m. = 3338m.; 3338 × 8 = 26704fur.; 26704fur. + 7fur. = 26711fur.; 26711 × 40 = 1068440rd.; 1068440rd. + 18rd. = 1068458 × $16\frac{1}{2}$ = 17629557ft. Ans.
20. $16\frac{1}{2}$)17629557ft.
40)1068458rd.
8)26711fur. 18rd.
$69\frac{1}{6}$)3338m. 7fur.
48deg. 18m. 7fur. 18rd. Ans.
21. 7 × 4 = 28R.; 28R. + 3R. = 31R.; 31 × 40 = 1240p.;

1240p. + 16p. = 1256p.; 1256 × 272¼ = 341946ft.; 341946ft. + 218ft. = 342164ft. Ans.

22. 342164 ÷ 272¼ = 1256p. 218ft.; 1256 ÷ 40 = 31R. 16p.; 31 ÷ 4 = 7A. 3R.; 7A. 3R. 16p. 218ft. Ans.

23. 25 × 640 = 16000A.; 16000 × 160 = 2560000p.; 2560000 × 272¼ = 696960000ft.; 696960000 × 144 = 100362240000in. Ans.

24. 100362240000 ÷ 144 = 696960000ft.; 696960000 ÷ 272¼ = 2560000p.; 2560000 ÷ 160 = 16000A.; 16000 ÷ 640 = 25 square miles, Ans.

25. 15 × 40 = 600ft.; 600 × 1728 = 10368000in. Ans.

26. 1036800 ÷ 1728 = 600ft.; 600 ÷ 40 = 15T. Ans.

27. 5 × 63 = 315gal.; 315gal. + 17gal. = 332gal.; 332 × 4 = 1328qt.; 1328qt. + 3qt. = 1331qt.; 1331 × 2 = 2662pt.; 2662 × 4 = 10648 gills, Ans.

28. 10648 ÷ 4 = 2662pt.; 2662 ÷ 2 = 1331qt.; 1331 ÷ 4 = 332gal. 3qt.; 332 ÷ 63 = 5hhd. 17gal.; 5hhd. 17gal. 3qt. Ans.

29. 29 × 54 = 1566gal.; 1566gal. + 30gal. = 1596gal.; 1596 × 4 = 6384qt.; 6384qt. + 3qt. = 6387qt. Ans.

30. 6387 ÷ 4 = 1596gal. 3qt.; 1596 ÷ 54 = 29hhd. 30gal.; 29hhd. 30gal. 3qt. Ans.

31. 15 × 36 = 540bu.; 540bu. + 16bu. = 556bu.; 556 × 4 = 2224pk.; 2224pk. + 3pk. = 2227pk.; 2227 × 8 = 17816qt.; 17816 × 2 = 35632pt. Ans.

32. 35632 ÷ 2 = 17816qt.; 17816 ÷ 8 = 2227pk.; 2227 ÷ 4 = 556bu. 3pk.; 556 ÷ 36 = 15ch. 16bu.; 15ch. 16bu. 3pk. Ans.

33. 365 × 24 = 8760h.; 8760h. + 6h. = 8766h.; 8766 × 60 = 525960m.; 525960 × 60 = 31557600 seconds, Ans.

34. 31557600 ÷ 60 = 525960m.; 525960 ÷ 60 = 8766h.; 8766 ÷ 24 = 365da. 6h. Ans.

35. 365 × 24 = 8760h.; 8760h. + 6h. = 8766h.; 8766 × 1842 = 16146972h. Ans.

36. 16146972 ÷ 8766 = 1842 years, Ans.

37. 8S. × 30 = 240°; 240° + 14° = 254°; 254 × 60 = 15240′; 15240′ + 18′ = 15258′; 15258 × 60 = 915480″; 915480″ + 17″ = 915497″, Ans.
38. 915497 ÷ 60 = 15258′ 17″; 15258 ÷ 60 = 254° 18′; 254 ÷ 30 = 8S. 14°; 8S. 14° 18′ 17″. Ans.
39. 13 × 144 × .02½ = $ 46.80, Ans.
40. 12 × 20 × .20 = $ 48.00, Ans.
41. 2 × 63 × 4 = 504qt.; 504 ÷ 3 = 168 bottles, Ans.
42. $ 1480.00 ÷ 25 = 59.20; $ 59.20 ÷ 160 = $ 0.37, cost of 1p.; 37A. 2R. 18p. = 6018p.; $ 0.37 × 6018 = $ 2226.66, Ans.
43. 5cwt. 3qr. 18lb. = 593lb.; 593 × 0.09 = $ 53.37; $ 1.75 × 25 = $ 43.75; $ 53.37 — $ 43.75 = $ 9.62, Ans.
44. 2lb. 7oz. = 31oz.; $ 46.50 ÷ 31 = $ 1.50, price per oz.; $ 1.50 × 12 = $ 18.00, price per pound, Ans.
45. 3T. 1cwt. 18lb. = 6118lb.; 6118 × 0.12 = $ 734.16; 6118 × 0.09 = $ 550.62; $ 734.16 — $ 550.62 = $ 183.54, Ans.
46. 37m. 7fur. 29rd. = 12149rd.; 12149 × 5.75 = $ 69856.75, Ans.
47. 15m. 6fur. 37rd. = 5077rd.; 5077 × 17.29 = $ 87,781.33, Ans.
48. 40p. 200ft. = 11090ft.; 11090 × 1.50 = $ 16,635, Ans.
49. 18ft. × 15 = 270 sq. ft.; 270 ÷ 9 = 30yd. Ans.
50. 47 × 10 = 470h.; 470h. + 7h. = 477h. = 28620m.; 28620 × 120 = 3434400 nails, Ans.
51. 80 × 50 = 4000 sq. rd.; 4000 ÷ 160 = 25 acres, Ans.
52. 18000000 ÷ 90 = 200000m. = 138da. 21h. 20m. Ans.
53. 9 × 15 × 23 = 3105yd.; 3105 × 0.08 = $ 248.40, Ans.
54. 6m. × 4½ = 27 sq. m.; 27 sq. m. = 17280A.; 17280 ÷ 90 = 192 lots, Ans.
55. 196d. 49m. = 282289m.; 282289 × 47 = 13267583 times, Ans.
56. 36ft. × 16 = 576 sq. ft.; 576 sq. ft. × 2 = 1152 sq. ft. = 165888in.; 165888 ÷ 27 = 6144 shingles, Ans.

57. 110m. = 6969600in.; 12ft. 6in. = 150in.; 6969600 ÷ 150 = 46464 times, Ans.
58. 25 × 7 × 5 × 12 × 15 × 178 = 28035000; 28035000 × 4.84 = $135689400, Ans.
59. 18 × 5½ = 99yd.; 99yd. + 5yd. = 104yd.; 104 × 3 = 312ft.; 312ft. + 2ft. = 314ft.; 314 × 12 = 3768in.; 3768in. + 11in. = 3779in. Ans.
60. 3779 ÷ 12 = 314ft. 11in.; 314 ÷ 3 = 104yd. 2ft.; 104 ÷ 5½ = 18rd. 5yd.; 18rd. 5yd. 2ft. 11in. Ans.
61. 5T. 17cwt. 3qr. 18lb. = 11793lb.; 11793 × 0.03 = $353.79, Ans.
62. 25 × 16 = 400 sq. rd. = 108900 sq. ft.; 108900 × 1.25 = $136,125; $136,125 — $100,000 = $36,125, Ans.

ADDITION OF COMPOUND NUMBERS.

(ART. **101**, p. **111.**)

3. 191lb. 1oz. 19pwt. 15gr.
5. 234℔ 1℥ 2℥ 1℈ 12gr.
7. 102T. 1cwt. 3qr. 9lb. 15oz. 10dr.
9. 189E.E. 0qr. 1na. 1¼in.
11. 74m. 3fur. 39rd. 2½yd. 2ft. 6in.
    ½yd. = 1ft. 6in.

    74m. 3fur. 39rd. 3yd. 1ft. 0in.
13. 179m. 0fur. 6cha. 3p. 18l.
15. 162A. 0R. 2p. 17¼yd. 4ft. 83in.
    ¼yd. = 2ft. 36in.

    162A. 0R. 2p. 17yd. 6ft. 119in.
17. 213C. 110ft. 1455in.
19. 193tun 2hhd. 27gal. 2qt. 0pt.
21. 211tun 0hhd. 53gal. 1qt. 1pt.
23. 211ch. 19bu. 3pk. 1qt. 1pt.
25. 256w. 4da. 3h. 39m. 19s.
27. 11S. 0° 30′ 21″.

SUBTRACTION OF COMPOUND NUMBERS.

(ART. **102**, p. **115.**)

3. 51£. 18s. 10d. 2far.
5. 691lb. 9oz. 4pwt. 22gr.
7. 63℔ 11℥ 1℥ 1℈ 19gr.
9. 1T. 2cwt. 0qr. 24lb. 3oz. 14dr.
11. 151E.E. 4gr. 2na. 1¼in.

13. 8deg. 59⅙m. 1fur. 39rd. 2½ft. 10in.
½ft. = 6in.

8deg.	59⅙m.	1fur.	39rd. 3ft.	4in.
	⅙m. =	1fur.	13rd. 5ft.	6in.
8deg.	59m.	3fur.	12rd. 8ft.	10in.

15. 13m. 5fur. 3cha. 1p. 21l.

17. 41A. 1R. 38p. 18½yd. 8ft. 143in.
½yd. = 2ft. 36in.

41A.	1R.	38p.	19yd. 2ft.	35in.

19. 371C. 126ft. 1683in.

21. 61tun 1hhd. 60gal. 1qt. 1pt. 2gi.

23. 59tun 2hhd. 42gal. 2qt. 1pt.

25. 53ch. 31bu. 1pk. 5qt. 0pt.

27. 4w. 1da. 9h. 26m. 27sec.

29. 4S. 7° 58′ 52″.

(ART. **103**, p. **118**.)

(2.)			(3.)			(4.)			(5.)		
y.	mo.	da.	y.	mo.	da.	y.	mo.	da.	y.	mo.	da.
1857	0	6	1857	3	25	1848	1	23	1845	5	8
1853	2	21	1852	10	15	1767	6	11	1767	2	15
3	9	15	4	5	10	80	7	12	78	2	23

MISCELLANEOUS EXERCISES IN ADDITION AND SUBTRACTION OF COMPOUND NUMBERS.

(PAGE **119**.)

(1.)				(2.)					(3.)				
lb.	oz.	pwt.	gr.	℔	ʒ	ʒ	℈	gr.	T.	cwt.	qr.	lb.	oz.
4	8	13	8	7	3	2	2	1	17	11	3	11	12
5	11	19	23	2	10	0	1	13	11	17	1	19	11
8	0	17	15	2	3	7	2	17	53	19	1	17	8
18	9	14	10	12	5	3	0	11	27	19	3	18	9
37	7	5	8						16	3	3	0	13
									127	12	1	18	5

(4.)

£.	s.	d.
7671	0	0
1728	17	9
5942	2	3

(5.)

lb.	oz.	pwt.	gr.
73	0	0	0
26	11	13	14
46	0	6	10

(6.)

lb	ʒ	ʒ	ϑ	gr
71	8	1	1	14
7	9	1	1	17
63	10	7	2	17

(7.)

T.	cwt.	qr.	lb.	oz.
28	13	0	0	0
10	17	0	19	14
17	15	3	5	2

(8.)

yd.	qr.	na.
37	3	3
18	1	3
31	1	2
87	3	0

(9.)

T.	cwt.	qr.	lb.
2	13	1	17
3	0	0	17
1	0	3	11
6	14	1	20

(10.)

m.	fur.	rd.	ft.	in.
16	7	18	14	11
19	1	13	16	9
97	3	27	13	3
47	5	37	13	10
181	2	18	8½	9
			½	=6
181	2	18	9	3

Note. As 8½ feet and 9 inches are equal to 8 feet and 15 inches, so we find 8 feet 15 inches equal to 9 feet 3 inches.

(11.)

yd.	qr.	na.
76	0	0
18	3	2
57	0	2

(12.)

m.	fur.	rd.	ft.	in.
20	0	0	0	0
3	4	18	13	8
16	3	21	2½	4
			½	=6
16	3	21	2	10

Note. The half-foot, which is 6 inches, is added to the 4 inches, and their sum is 10 inches.

(13.)

A.	R.	p.	ft.	in.
144	3	0	0	0
18	1	17	200	100
126	1	22	71¼	44
			¼	=36
126	1	22	71	80

Note. The ¼ of a foot, which is 36 inches, is added to the 44 inches, and their sum is 80 inches.

(14.)

cord.	ft.	in.
18	0	0
3	100	1000
14	27	728

(15.)

A.	R.	p.	ft.
169	3	15	227
187	1	15	165
217	2	28	165
574	3	20	12½

(16.)

cord.	ft.	in.
18	116	1000
17	111	1600
21	109	1716
58	82	860

(17.)

T.	ft.	in.
17	0	0
5	18	765
11	21	963

(18.)

gal.	qt.	pt.
169	0	0
76	3	1
92	0	1

(19.)

ch.	bu.	pk.	qt.
17	18	0	0
5	20	1	7
11	33	2	1

(20.)

y.	mo.	d.	h.	m.	s.
83	0	0	0	0	0
47	10	27	18	50	14
35	1	2	5	9	46

(21.)

S.	°	′	″
11	15	36	15
5	18	50	18
5	26	45	57

(22.)

gal.	qt.	pt
167	3	1
186	1	1
108	2	1
123	3	0
586	2	1

(23.)

bu.	pk.	qt.	pt.
17	1	7	1
18	3	2	0
19	1	3	1
51	3	0	1
107	1	5	1

(24.)

y.	mo.	d.
13	4	13
12	11	23
18	9	29
45	2	5

(25.)

y.	d.	h.	m.	s.
18	345	13	37	15
87	169	12	16	28
316	144	20	53	18
13	360	21	57	15
436	290	20	44	16

(27.)

lb.	oz.	pwt.	gr.
106	0	0	0
5	11	12	15
3	0	13	14
7	11	14	23
17	0	1	4
88	11	18	20

(28.)

yd.	qr.	na.
17	3	0
3	3	2
4	1	3
8	1	1
9	1	3

(29.)

S.	°	′	″
3	18	45	15
7	15	36	18
5	21	38	27
4	26	0	0

NOTE. As this question is in Motion, it is necessary to reject the 12s in the sum of the signs.

(30.)

S.	°	′	″
3	18	14	35
11	25	30	50
3	22	43	45

NOTE. To perform this question, we add 12 signs to the longitude of the star, and from their sum subtract the longitude of the planet, because all the planets move eastward, as seen from the sun.

MULTIPLICATION OF COMPOUND NUMBERS.

(ART. 106, p. 124.)

(3.)

m.	fur.	rd.	
3	7	18	×30=5×6
		5	
19	5	10	
		6	
117	7	20	

(4.)

T.	cwt.	qr.	lb.	
2	7	3	18	×84=7×12
			7	
16	15	2	1	
			12	
201	6	0	12	

(5.)

yd.	qr.	na.	
7	3	2	×72=6×12
		6	
47	1	0	
		12	
567	0	0	

(6.)

yd.	qr.	na.	
3	2	1	×132=12×11
		12	
42	3	0	
		11	
470	1	0	

(ART. 107, p. 125.)

NOTE. It is sometimes more convenient to use as multipliers the nearest composite numbers than to follow the Rule.

(2.)

lb.	oz.	dr.	
17	10	13	×2
		10	
176	12	2	
		6	
1060	8	12	=60
35	5	10	= 2
1095	14	6	=62

(3.)

£.	s.	d.	
2	17	$9\frac{1}{2}$	×7
		10	
28	17	11	
		9	
260	1	3	=90
20	4	$6\frac{1}{2}$	= 7
280	5	$9\frac{1}{2}$	=97

(4.)

m.	fur.	rd.	yd.	ft.	in.	
17	3	19	3	2	7	×8
					10	
174	2	36	5	1	10	
					3	
523	0	30	5	2	6	=30
139	3	37	$2\frac{1}{2}$	2	8	= 8
662	4	28	3	2	2	=38

(5.)

bu.	pk.	qt.	pt.	
27	3	6	1	×8
			10	
279	2	1	0	
			9	
2515	3	1	0	=90
223	2	4	0	= 8
2739	1	5	0	=98

(6.)

yd.	qr.	na.	
7	3	2	×7
		10	
78	3	0	×4
		10	
787	2	0	
		3	
2362	2	0	=300
315	0	0	= 40
55	0	2	= 7
2732	2	2	=347

(7.)

A.	R.	p.	yd.	ft.	in.	
13	3	14	18	7	76	×1
					9	
124	2	11	17¾	4	108	
					2	
249	0	23	6½	0	72	=18
13	3	14	18	7	76	= 1
262	3	37	24½	8	4	=19
			¼			=2 36
262	3	37	25	1	40	=19

(8.)

T.	cwt.	qr.	lb.	oz.	
17	14	3	18	14	×1
				10	
177	9	1	13	12	×5
				10	
1774	13	3	12	8	
				4	
7098	15	2	0	0	=400
887	6	3	18	12	= 50
17	14	3	18	14	= 1
8003	17	1	12	10	451

DIVISION OF COMPOUND NUMBERS.

(ART. **110**, p. **127**.

(2.)

£.	s.	d.
6)6409	10	0
6)1068	5	0
10)178	0	10
17	16	1

(3.)

m.	fur.	rd.
5)117	7	20
6)23	4	28
3	7	18

(4.)

T.	cwt.	qr.	lb.
12)201	6	6	12
7)16	15	2	1
2	7	3	18

(5.)

yd.	qr.	n.
6)567	0	0
12)94	2	0
7	3	2

(6.)

yd.	qr.	na.
12)470	1	0
11)39	0	3
3	2	1

(ART. 111, p. 128.)

(2.)

lb. oz. dr.

62)1095 14 6(17lb
62
475
434
41
16
250
42
62)670(10oz.
62
50
16
306
50
62)806(13dr.
62
186
186

(3.)

£. s. d.

97)280 5 9½(2£.
194
86
20
97)1725(17s.
97
755
679
76
12
97)921(9d.
873
48
4
97)194(2far.
194

(4.)

m. fur. rd. yd. ft. in.

38)662 4 28 3 2 2(17m.
38
282
266
16
8
38)132(3fur.
114
18
40
38)748(19rd.
38
368
342
26
5½
133
13
38)146(3yd.
114
32
3
38)98(2ft.
76
22
12
38)266(7in.
266

(5.)

bu. pk. qt. pt.

98)2739 1 5 0(27bu.
196
779
686
93
4
98)373(3pk.
294
79
8
98)637(6qt.
588
49
2
98)98(1pt.
98

(6.)

yd. qr. na.

347)2732 2 2(7yd.
2429
303
4
347)1214(3qr.
1041
173
4
347)694(2na.
694

(7.)

A. R. p. yd. ft. in.

19)262 3 37 25 1 40(13A.
19
72
57
15
4
19)63(3R.
57
6
40
19)277(14p.
19
87
76
11
30¼
355
2¾
19)357¾(18yd.
19
167
152
15¾
9
19)142¾(7ft.
133
9¾
144
36
36
940
108
1444
(Carried up.)

(Brought up.)
19)1444(76in.
133
114
114

(8.)

T. cwt. qr. lb. oz.

451)8003 8 1 0 10(17T.
451
3493
3157
336
20
451)6728(14cwt.
451
2218
1804
414
4
451)1657(3qr.
1353
304
25
1520
608
451)7600(16lb.
451
3090
2706
384
16
2304
385
451)6154(13oz.
451
1644
1353
291

MISCELLANEOUS EXAMPLES IN MULTIPLICATION AND DIVISION OF COMPOUND NUMBERS.

(ART. **111**, p. **129.**)

(1.)

cwt.	qr.	lb.
8	3	20
		5
44	3	0
		6
268	2	0
68	2	0
200	0	0

£.	s.	d.	
1	17	6	
		10	
18	15	0	
		10	
187	10	0	
		2	
375	0	0	Ans.

(2.)

A.	R.	p.	
12)11067	1	8	
12)922	1	4	
76	3	17	
4			
307R.			
40			
12297p.			

£.	s.	d.	
0	1	$9\frac{1}{2}\times7$	
		10	
0	17	11×9	
		10	
8	19	2×2	
		10	
89	11	8×2	
		10	
895	16	8	=10000
179	3	4	= 2000
17	18	4	= 200
8	1	3	= 90
	12	$6\frac{1}{2}$	= 7
1101	12	$1\frac{1}{2}$	=12297

(3.)

m.	fur.	rd.		m.	fur.	rd.	
18	7	32		2644	3	12	
		10		1897	4	0	
189	6	0		746	7	12	Ans.
		10					
1897	4	0	Ans.				

(4.)

y.	d.	
1807	365	
1798	9	
9y.	3285d.	
	1	add for leap year.
	67	" from July 4 to
	3353 days.	[Sept. 9.

h.	m.	
11	19	P. M.
3	17	A. M.
20	2	

Ans. 3353d. 20h. 2m.

(5.)

3124rd. × 8 = 24992rd. = 78m. 0fur. 32rd.

m.	fur.	rd
121	5	0
78	0	32
Ans. 43	4	8

(6.)

cwt.	qr.	lb.
7	3	18
		16
126	3	13 = 12688lb.
71	1	12
55	2	1 = 5551lb.

7137 × 6 = $ 428.22
5551 × 7 = 388.57
$ 816.79
12688 × 5 = $ 634.40
Ans. $ 182.39

cwt.	qr.	lb.
7	3	18
		9
71	1	12 = 7137lb.

(7.)

£.	s.	d.
17	18	10
		17
305	0	2
207	0	0
35	0	2 Ans.

£.	s.	d.
1	17	6
		144
270	0	0

(8.)

m.	fur.	rd.
17	4	30
		10
175	7	20
124	3	0
51	4	20
50		
1	4	20 Ans.

m.	fur.	rd.
12	3	20
		10
124	3	0

(9.)

$ 5.75 × 760 = $ 4370
4370 ÷ .02 = 218500lb.
218500lb. ÷ 2 = 109250lb.;
109250lb. = 54T. 12cwt. 2qr.
Ans.

(10.)

A.	R.	p.	ft.
0	0	44	200
			17
4	3	0	133
2	2	0	240
2	0	39	165¼

A.	R.	p.	ft.
2	0	39	165¼ = 97903ft.

1s. 2½d. × 97903 = 5914£. 19s. 5½d. Ans.

(11.)

$100 \times 100 = 10000$ sq. rd. $3563 \times \$\,1.75 = \$\,6235.25$ Ans.

5A.3R. 17p. = 937
$50 \times 50 = 2500$
3000
6437
3563 sq. rd.

(12.)

78A. 3R. 30p. = 12630p.; $30 \times 30 \times 10 = 9000$p.; $9000 \times 8.50 = \$\,76500$; 12630p. — 9000p. = 3630p.; $3630 \times 272\frac{1}{4} = 988267\frac{1}{2}$ft.; $988267\frac{1}{2} \times 0.02 = \$\,19765.35$; $\$\,76500 + \$\,19765.35 = \$\,96265.35$.; $\$\,96265.35 - \$\,7000 = \$\,89265.35$, Ans.

CANCELLATION.

(Art. 117, p. 135.)

5. $\frac{\overset{2}{8} \times 6 \times 3}{6 \times 3 \times 4} = 2.$

6. $\frac{17 \times 6 \times 2}{6 \times 2 \times 17} = 1.$

7. $\frac{15 \times 30 \times 10}{10 \times 15} = 30.$

10. $\frac{\overset{3}{9} \times \overset{2}{8} \times \overset{2}{2} \times \overset{2}{14}}{3 \times 4 \times \underset{2}{6} \times 7} = 4.$

11. $\frac{\overset{2}{16} \times 5 \times \overset{5}{10} \times \overset{3}{18}}{8 \times 6 \times 2 \times \underset{2}{12}} = \frac{25}{2}$ [$= 12\frac{1}{2}$.

12. $\frac{\overset{2}{22} \times \overset{3}{9} \times \overset{2}{12} \times 5}{3 \times 11 \times 6 \times 4} = 15.$

13. $\frac{\overset{5}{25} \times 7 \times \underset{2}{\overset{2}{14}} \times \underset{3}{\overset{9}{36}}}{4 \times \underset{2}{10} \times \underset{3}{21} \times \underset{6}{54}} = \frac{35}{18}$ [$= 1\frac{17}{18}$.

14. $\frac{\overset{2}{26} \times \overset{3}{72} \times \overset{9}{81} \times \overset{2}{12}}{\underset{4}{36} \times 13 \times 24 \times \underset{6}{54}} = 3.$

16. $\frac{\overset{2}{8} \times 4 \times 9 \times 2 \times 12 \times 16 \times 5}{4 \times 6 \times 6 \times 3 \times 8 \times 4 \times 20} = 2.$

17. $$\frac{\overset{8}{\cancel{6}}\times\cancel{15}\times\overset{7}{\cancel{16}}\times\cancel{24}\times\cancel{12}\times\cancel{21}\times\cancel{27}}{\cancel{2}\times\cancel{10}\times\cancel{9}\times\cancel{8}\times\underset{3}{\cancel{36}}\times\cancel{7}\times\underset{3}{\cancel{81}}} = 8.$$

(Art. **124**, p. **138**.)

(2.) 85)95(1 85 — 10)85(8 80 — 5)10(2 10

(3.) 72)168(2 144 — 24)72(3 72

(4.) 119)121(1 119 — 2)119(59 118 — 1)2(2 2

(5.) 12)18(1 12 — 6)12(2 12

(5.) 6)24(4 24

(5.) 6)30(5 30 —

(6.) 12)15(1 12 — 3)12(4 12

(6.) 3)18(6 18

(Art. **128**, p. **140**.)

(3.)

2)3, 4, 5, 6, 7, 8
3)3, 2, 5, 3, 7, 4
2)1, 2, 5, 1, 7, 4
1, 1, 5, 1, 7, 2

$2\times3\times2\times5\times7\times2 = 840$ Ans.

(4.)

4)10, 12, 16, 20, 24
2)10, 3, 4 5. 6
3) 5, 3, 2, 5, 3
5) 5, 1, 2, 5, 1
1, 1, 2, 1, 1

$4\times2\times3\times5\times2 = 240$ Ans.

(5.)

2)9 8 12 18 24 36 72
3)9 4 6 9 12 18 36
2)3 4 2 3 4 6 12
3)3 2 1 3 2 3 6
2)1 2 1 1 2 1 2
1 1 1 1 1 1 1

$2\times3\times2\times3\times2=72$ Ans.

(5. By Cancellation.)

)9 8 12 18 24 36 72

Ans. 72.

(6.)

2)10 12 16 18 20
2)6 8 9 10
3)3 4 9 5
1 4 3 5

$2\times2\times3\times4\times3\times5 = 720$ days.

COMMON FRACTIONS.

2. (ART. **135**, p. **142.**) $\frac{1}{5}$
3. $\frac{2}{9}$
4. $\frac{1}{8}$
5. $\frac{2}{3}$
6. $\frac{1}{2}$
7. $\frac{123}{386}$
8. $\frac{1}{7}$
9. $\frac{7891}{8116}$
10. $\frac{173}{309}$

2. (ART. **136**, p. **143.**) $5\frac{2}{7}$
3. $13\frac{1}{4}$
4. $10\frac{3}{11}$
5. $9\frac{1}{11}$
6. $187\frac{7}{12}$
7. $168\frac{2}{9}$
8. $18848\frac{8}{117}$
9. $5142\frac{1}{117}$
10. $360\frac{1}{13}$
11. $12322\frac{2}{111}$
12. $125\frac{1}{1}$
13. $150\frac{1}{6}$
14. $675\frac{1}{9}$
15. $343\frac{1}{1}$
16. $1260\frac{1}{15}$

2. (ART. **137**, p. **144.**) 12
3. $10\frac{8}{17}$
4. $10\frac{1}{111}$
5. $1\frac{359}{876}$
6. $142\frac{6}{7}$
7. 1
8. 567
9. $9\frac{32}{78}$
10. $4\frac{4}{153}$

(ART. **138**, p. **145.**)

3. $\frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} = \frac{16}{35}$ Ans.
4. $\frac{7}{8} \times \frac{9}{11} \times \frac{7}{1} = \frac{441}{88} = 5\frac{1}{88}$ [Ans.
5. $\frac{7}{8} \times \frac{9}{11} \times \frac{3}{8} \times \frac{4}{7} = \frac{27}{176}$ Ans.
6. $\frac{11}{17} \times \frac{1}{2} \times \frac{3}{4} \times \frac{1}{20} \times \frac{7}{1} = \frac{231}{2720}$ [Ans.
7. $\frac{3}{5} \times \frac{4}{11} \times \frac{11}{17} \times \frac{17}{23} \times \frac{23}{4} = \frac{3}{5}$ [Ans.
8. $\frac{1}{5} \times \frac{8}{9} \times \frac{9}{11} \times \frac{5}{8} \times \frac{3}{7} = \frac{3}{77}$ [Ans.
9. $\frac{3}{7} \times \frac{2}{4} \times \frac{7}{9} \times \frac{9}{10} \times \frac{13}{3} =$ $5\frac{26}{56}$ Ans.
10. $\frac{5}{15} \times \frac{8}{9} \times \frac{7}{11} = \frac{35}{66}$ Ans.
11. $\frac{8}{11} \times \frac{2}{35} \times \frac{3}{15} \times \frac{11}{77} = 3$ [Ans.
12. $\frac{5}{7} \times \frac{3}{15} \times \frac{4}{16} \times \frac{5}{4} \times \frac{11}{5} =$ $\frac{11}{16}$ Ans.

(ART. **140**, p. **147**.)

(2.)

$3 \times 6 = 18 = \frac{18}{24} = \frac{9}{12}$
$5 \times 4 = 20 = \frac{20}{24} = \frac{10}{12}$
$4 \times 6 = 24$

(3.)

$7 \times 5 \times 2 = 70 = \frac{70}{90}$
$4 \times 9 \times 2 = 72 = \frac{72}{90}$
$1 \times 9 \times 5 = 45 = \frac{45}{90}$
$9 \times 5 \times 2 = 90$

(4.)

$4 \times 8 \times 11 = 352 = \frac{352}{616}$
$3 \times 7 \times 11 = 231 = \frac{231}{616}$
$5 \times 7 \times 8 = 280 = \frac{280}{616}$
$7 \times 8 \times 11 = 616$

(5.)

$8 \times 12 \times 3 = 288 = \frac{288}{324}$
$5 \times 9 \times 3 = 135 = \frac{135}{324}$
$2 \times 9 \times 12 = 216 = \frac{216}{324}$
$9 \times 12 \times 3 = 324$

(6.)

$1 \times 5 \times 8 \times 4 = 160 = \frac{160}{960}$
$2 \times 6 \times 8 \times 4 = 384 = \frac{384}{960}$
$7 \times 6 \times 5 \times 4 = 840 = \frac{840}{960}$
$1 \times 6 \times 5 \times 8 = 240 = \frac{240}{960}$
$6 \times 5 \times 8 \times 4 = 960$

(ART. **141**, p. **148**.)

(2.)

$\frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{7}{8}$

2)4 5 6 8
2)2 5 3 4
1 5 3 2

$2 \times 2 \times 5 \times 3 \times 2 = 120$

	120
4	$30 \times 3 = 90$
5	$24 \times 4 = 96$
6	$20 \times 5 = 100$
8	$15 \times 7 = 105$

$\frac{90}{120}, \frac{96}{120}, \frac{100}{120}, \frac{105}{120}$ Ans.

(3.)

$\frac{3}{4}, \frac{2}{5}, \frac{4}{9}, \frac{2}{11}$

$4 \times 5 \times 9 \times 11 = 1980$

	1980
4	$495 \times 3 = 1485$
5	$396 \times 2 = 792$
9	$220 \times 4 = 880$
11	$180 \times 2 = 360$

$\frac{1485}{1980}, \frac{792}{1980}, \frac{880}{1980}, \frac{360}{1980}$ Ans.

(4.)

$\frac{7}{8}$, $\frac{9}{10}$, $\frac{31}{4}$

4)8 10 4

2)2 10 1

1 5 1

$4 \times 2 \times 5 = 40$

	40
8	$5 \times 7 = 35$
10	$4 \times 9 = 36$
4	$10 \times 31 = 310$

$\frac{35}{40}$, $\frac{36}{40}$, $\frac{310}{40}$ Ans.

(5.)

$\frac{3}{7}$, $\frac{9}{14}$, $\frac{11}{28}$, $\frac{38}{7}$

7)7 14 28 7

2)1 2 4 1

1 1 2 1

$7 \times 2 \times 2 = 28$

	28
7	$4 \times 3 = 12$
14	$2 \times 9 = 18$
28	$1 \times 11 = 11$
7	$4 \times 38 = 152$

$\frac{12}{28}$, $\frac{18}{28}$, $\frac{11}{28}$, $\frac{152}{28}$ Ans.

(6.)

$\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{5}{12}$

2)2 4 6 8 8 12

3)1 2 3 4 4 6

2)1 2 1 4 4 2

2)1 1 1 2 2 1

1 1 1 1 1 1

$2 \times 3 \times 2 \times 2 = 24$

	24
2	$12 \times 1 = 12$
4	$6 \times 3 = 18$
6	$4 \times 5 = 20$
8	$3 \times 5 = 15$
8	$3 \times 7 = 21$
12	$2 \times 5 = 10$

$\frac{12}{24}$, $\frac{18}{24}$, $\frac{20}{24}$, $\frac{15}{24}$, $\frac{21}{24}$, $\frac{10}{24}$ Ans.

(7.)

$\frac{4}{9}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{12}$

3)9 3 3 4 6 12

2)3 1 1 4 2 4

2)3 1 1 2 1 2

3 1 1 1 1 1

$3 \times 2 \times 2 \times 3 = 36$

	36
9	$4 \times 4 = 16$
3	$12 \times 2 = 24$
3	$12 \times 1 = 12$
4	$9 \times 1 = 9$
6	$6 \times 1 = 6$
12	$3 \times 1 = 3$

$\frac{16}{36}$, $\frac{24}{36}$, $\frac{12}{36}$, $\frac{9}{36}$, $\frac{6}{36}$, $\frac{3}{36}$ Ans.

(8.)

$\frac{5}{6}$, $\frac{4}{9}$, $\frac{7}{12}$

3)6 9 12

2)2 3 4

1 3 2

$3\times2\times3\times2=36$

	36
6	$6\times5=30$
9	$4\times4=16$
12	$3\times7=21$

$\frac{30}{36}$, $\frac{16}{36}$, $\frac{21}{36}$ Ans.

(9.)

$7\frac{3}{4}$, $5\frac{6}{11}$, 7, $8=\frac{31}{4}$, $\frac{61}{11}$, $\frac{7}{1}$, $\frac{8}{1}$

$4\times11=44$

	44
4	$11\times31=341$
11	$4\times61=244$
1	$44\times7=308$
1	$44\times8=352$

$\frac{341}{44}$, $\frac{244}{44}$, $\frac{308}{44}$, $\frac{352}{44}$ Ans.

(10.)

$\frac{3}{4}$, 4, 5, 7, $9=\frac{3}{4}$, $\frac{4}{1}$, $\frac{5}{1}$, $\frac{7}{1}$, $\frac{9}{1}$

	4
4	$1\times3=3$
1	$4\times4=16$
1	$4\times5=20$
1	$4\times7=28$
1	$4\times9=36$

$\frac{3}{4}$, $\frac{16}{4}$, $\frac{20}{4}$, $\frac{28}{4}$, $\frac{36}{4}$ Ans.

2. (ART. **143**, p. **149**.) $3\frac{10}{11}$

3. $2\frac{1}{17}$

4. $2\frac{1}{25}$

5. $2\frac{19}{47}$

6. $1\frac{112}{137}$

7. $1\frac{1961}{1771}$

(ART. **144**, p. **149**.)

(2.)

4) 8 12 16

2) 2 3 4

1 3 2

$4\times2\times3\times2=48$

	48
8	$6\times5=30$
12	$4\times11=44$
16	$3\times13=39$

$\frac{113}{48}=2\frac{17}{48}$ Ans.

(3.)

2) 20 18 14

10 9 7

$2\times10\times9\times7=1260$

	1260
20	$63\times9=567$
18	$70\times11=770$
14	$90\times5=450$

$\frac{1787}{1260}=1\frac{527}{1260}$ [Ans.

(4.)

$21 \times 37 = 777$

	777
21	$37 \times 19 = 703$
37	$21 \times 31 = 651$

$$\frac{1354}{777} = 1\tfrac{577}{777}$$ [Ans.

(5.)

4)	4	6	8	12
3)	1	6	2	3
2)	1	2	2	1
	1	1	1	1

$4 \times 2 \times 3 = 24$

	24
4	$6 \times 3 = 18$
6	$4 \times 5 = 20$
8	$3 \times 3 = 9$
12	$2 \times 1 = 2$

$$\frac{49}{24} = 2\tfrac{1}{24}$$ Ans.

(6.)

3)	9	21	24	2
2)	3	7	8	2
	3	7	4	1

$3 \times 2 \times 3 \times 7 \times 4 = 504$

	504
9	$56 \times 4 = 224$
21	$24 \times 8 = 192$
24	$21 \times 11 = 231$
2	$252 \times 1 = 252$

$$\frac{899}{504} = 1\tfrac{395}{504}$$ [Ans.

(7.)

12)	72	84	96
2)	6	7	8
	3	7	4

$12 \times 2 \times 3 \times 7 \times 4 = 2016$

	2016
72	$28 \times 19 = 532$
84	$24 \times 51 = 1224$
96	$21 \times 71 = 1491$

$$\frac{3247}{2016} = 1\tfrac{1231}{2016}$$ [Ans.

(8.)

25)	25	50	75	100
2)	1	2	3	4
	1	1	3	2

$25 \times 2 \times 3 \times 2 = 300$

	300
25	$12 \times 3 = 36$
50	$6 \times 49 = 294$
75	$4 \times 74 = 296$
100	$3 \times 81 = 243$

$$\frac{869}{300} = 2\tfrac{269}{300}$$ Ans.

(9.)

2)2	3	4	5	6	7	8
2)1	3	2	5	3	7	4
3)1	3	1	5	3	7	2
1	1	1	5	1	7	2

$2\times2\times3\times5\times7\times2=840$

	840
2	$420\times1=420$
3	$280\times2=560$
4	$210\times3=630$
5	$168\times4=672$
6	$140\times5=700$
7	$120\times6=720$
8	$105\times7=735$

$\frac{4437}{840}=5\frac{79}{280}$ Ans.

(10.)

3)9	10	11	12	13	14	15
2)3	10	11	4	13	14	5
5)3	5	11	2	13	7	5
3	1	11	2	13	7	1

$3\times2\times5\times3\times11\times2\times13\times7=$ [180180

	180180
9	$20020\times8=160160$
10	$18018\times9=162162$
11	$16380\times10=163800$
12	$15015\times11=165165$
13	$13860\times12=166320$
14	$12870\times13=167310$
15	$12012\times14=168168$

1158085

$\frac{1158085}{180180}=6\frac{14401}{36036}$ Ans.

$\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}=\frac{1}{2}$

$\frac{5}{6}\times\frac{7}{8}=\frac{35}{48}$

2)2 48

1 24

$2\times24=48$

(11.)

	48
2	$24\times1=24$
48	$1\times35=35$

$\frac{59}{48}=1\frac{11}{48}$ Ans.

(12.)

$\frac{3}{4}\times\frac{7}{8}=\frac{21}{32}$; $\frac{11}{12}\times\frac{1}{2}=\frac{11}{24}$

8)32 24

4 3

$8\times4\times3=96$

	96
32	$3\times21=63$
24	$4\times11=44$

$\frac{107}{96}=1\frac{11}{96}$ Ans.

(13.)

$\frac{1}{3}\times\frac{2}{9}=\frac{2}{27}$; $\frac{1}{5}\times\frac{7}{10}=\frac{7}{50}$

$27\times50=1350$

	1350
27	$50\times2=100$
50	$27\times7=189$

289

$\frac{289}{1350}$ Ans.

(14.)

$$\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}=\frac{2}{5}$$

$$\frac{5}{6}\times\frac{6}{7}\times\frac{7}{10}=\frac{5}{10}=\frac{1}{2}$$

$2\times 5=10$

10	
5	$2\times 2=4$
2	$5\times 1=5$

$\frac{9}{10}$ Ans.

(15.)

$$\frac{1}{3}\times\frac{3}{11}\times\frac{11}{12}=\frac{1}{12}$$

$$\frac{1}{2}\times\frac{2}{9}=\frac{1}{9}$$

3)12 9

4 3

$3\times 4\times 3=36$

36	
12	$3\times 1=3$
9	$4\times 1=4$

$\frac{7}{36}$ Ans.

(16.)

$3\frac{3}{7}=\frac{24}{7}$; $4\frac{11}{14}=\frac{67}{14}$

7)7 14

1 2

$7\times 2=14$

14	
7	$2\times 24=48$
14	$1\times 67=67$

$\frac{115}{14}=8\frac{3}{14}$ Ans.

(17.)

$4\frac{3}{4}=\frac{19}{4}$; $5\frac{6}{7}=\frac{41}{7}$

$4\times 7=28$

28	
4	$7\times 19=133$
7	$4\times 41=164$

$\frac{297}{28}=10\frac{17}{28}$ Ans.

$17\frac{3}{4}=\frac{71}{4}$; $18\frac{5}{12}=\frac{221}{12}$

4)4 12

1 3

$4\times 3=12$

(18.)

12	
4	$3\times 71=213$
12	$1\times 221=221$

$\frac{434}{12}=36\frac{1}{6}$ Ans.

(ART. 147, p. 151.)

2. $\frac{5}{11}$ | 4. $\frac{23}{37}$ | 6. $\frac{2}{8}\frac{3}{6}\frac{9}{4}$ | 8. $\frac{4}{5}$

3. $\frac{4}{15}$ | 5. $\frac{148}{111}$ | 7. $\frac{1}{10}$

SUBTRACTION OF COMMON FRACTIONS.

(2.) (ART. **148**, p. **152**.)

$\frac{7}{18}-\frac{4}{21}$

$3\times6\times7=126$

126	
18	$7\times7=49$
21	$6\times4=24$

$\frac{25}{126}$ Ans.

3)18 21

6 7

(3.)

$\frac{13}{20}-\frac{11}{16}$

$4\times5\times4=80$

80	
20	$4\times19=76$
16	$5\times11=55$

$\frac{21}{80}$ Ans.

4)20 16

5 4

(4.)

$\frac{17}{24}-\frac{7}{20}$

$4\times6\times5=120$

120	
24	$5\times17=85$
20	$6\times\ 7=42$

$\frac{43}{120}$ Ans.

4)24 20

6 5

(5.)

$\frac{11}{34}-\frac{1}{10}$

$2\times17\times5=170$

170	
34	$5\times11=55$
10	$17\times\ 1=17$

$\frac{38}{170}=\frac{19}{85}$ Ans.

2)34 10

17 5

(6.)

$\frac{31}{36}-\frac{9}{16}$

$4\times9\times4=144$

144	
36	$4\times31=124$
16	$9\times\ 9=\ 81$

$\frac{43}{144}$ Ans.

4)36 16

9 4

(7.)

$\frac{18}{37}-\frac{3}{11}$

$37\times11=407$

407	
37	$11\times18=198$
11	$37\times\ 3=111$

$\frac{87}{407}$ Ans.

(8.)

$\frac{111}{200}-\frac{1}{19}$

$200\times19=3800$

3800	
200	$19\times111=2109$
19	$200\times\ 1=\ 200$

$\frac{1909}{3800}$ Ans.

(9.)

$\frac{1}{10}-\frac{1}{1000}$

$10\times100=1000$

1000	
10	$100\times1=100$
1000	$1\times1=\ 1$

$\frac{99}{1000}$ Ans.

10)10 1000

1 100

(10.)

$\frac{2}{3}\times\frac{9}{11}=\frac{18}{33}=\frac{6}{11}$; $\frac{1}{4}\times\frac{2}{7}=\frac{2}{28}=\frac{1}{14}$

$\frac{6}{11}-\frac{1}{14}$ $11\times14=154$

154	
11	$14\times6=84$
14	$11\times1=11$
	$\overline{73}$

$\frac{73}{154}$ Ans.

(11.)

$\frac{1}{9}\times\frac{9}{10}=\frac{1}{10}$; $\frac{1}{12}\times\frac{12}{13}=\frac{1}{13}$

$\frac{1}{10}-\frac{1}{13}$ $10\times13=130$

130	
10	13
13	10
	3

$\frac{3}{130}$ Ans.

(12.)

$\frac{3}{8}\times12\frac{5}{6}=\frac{3}{8}\times\frac{77}{6}=\frac{231}{48}=\frac{77}{16}$;

$\frac{2}{5}\times9\frac{7}{12}=\frac{2}{5}\times\frac{115}{12}=\frac{230}{60}=\frac{23}{6}$; $\frac{77}{16}-\frac{23}{6}$

2)16 6

8 3

$2\times8\times3=48$

48	
16	$3\times77=231$
6	$8\times23=184$
	$\overline{47}$

$\frac{47}{48}$ Ans.

(ART. **149**, p. **152**.)

7. From 23
Take $13\frac{1}{3}$
Ans. $9\frac{2}{3}$

8. 47
$\frac{13}{20}$
Ans. $46\frac{7}{20}$

9. 139
$75\frac{11}{25}$
Ans. $63\frac{14}{25}$

(ART. **150**, p. **154**.)

NOTE. In the following questions, the new numerator is found by multiplying each numerator by the denominator of the other fraction; and the common denominator is obtained by multiplying together the two denominators.

(12.)
$19\frac{1}{6}=19\frac{11}{66}$
$7\frac{3}{11}=7\frac{18}{66}$
Ans. $11\frac{29}{66}$

(13.)
$15\frac{1}{7}=15\frac{4}{28}$
$8\frac{1}{4}=8\frac{7}{28}$
Ans. $6\frac{25}{28}$

(14.)
$9\frac{1}{13}=9\frac{19}{247}$
$3\frac{18}{19}=3\frac{234}{247}$
Ans. $5\frac{32}{247}$

(15.)
$71\frac{1}{15}=71\frac{12}{180}$
$13\frac{7}{12}=13\frac{105}{180}$
Ans. $57\frac{87}{180}$

(16.)

$61\frac{11}{17} = 61\frac{154}{238}$

$33\frac{13}{14} = 33\frac{221}{238}$

Ans. $27\frac{171}{238}$

(17.)

63

$12\frac{3}{8}$

Ans. $50\frac{5}{8}$

(18.)

$2\frac{1}{8} = 2\frac{1}{8}$

$3\frac{1}{4} = 3\frac{2}{8}$

$1\frac{1}{2} = 1\frac{4}{8}$

$6\frac{7}{8}$

10

$6\frac{7}{8}$

Ans. $3\frac{1}{8}$

2. (ART. **153**, p. **155.**) $6\frac{3}{7}$

3. $2\frac{2}{3}$

4. $1\frac{7}{5}$

5. 49

6. $76\frac{1}{12}$

7. $166\frac{13}{17}$

8. $352\frac{61}{117}$

9. $43\frac{1}{2}$

10. $\$ 7\frac{7}{5}$

11. \$ 0.42

12. \$ 3.24

13. $\$ 69\frac{1}{8}$

2. (ART. **154**, p. **156.**) 28

3. 88

4. 325

5. 1610

6. $243\frac{5}{17}$

7. $8\frac{2}{39}$

8. $23\frac{29}{37}$

9. $6\frac{51}{136}$

(ART. **155**, p. **157.**)

(3.)

$9\frac{3}{8}$ × 5 = 45

$\frac{1}{8}$ × 5 = $\frac{5}{8}$

8)15

Ans. $46\frac{7}{8}$

(4.)

$12\frac{3}{5}$ × 7 = 84

$\frac{1}{5}$ × 7 = $\frac{7}{5}$

5)21

Ans. $88\frac{1}{5}$

(5.)

$8\frac{11}{12}$ × 9 = 72

$\frac{1}{4}$ × 9 = $\frac{9}{4}$

12)99

Ans. $80\frac{1}{4}$

(6.)

$7\frac{1}{8}$ × 10 = 70

$\frac{1}{8}$ × 10 = $1\frac{1}{8}$

9)10

Ans. $71\frac{1}{8}$

(7.)

$11\frac{6}{7}$ × 8 = 88

$\frac{6}{7}$ × 8 = $6\frac{6}{7}$

7)48

Ans. $94\frac{6}{7}$

(8.)

$7\frac{6}{11}$ × 5 = 35

$\frac{8}{11}$ × 5 = $2\frac{8}{11}$

11)30

Ans. $\$ .37\frac{8}{11}$

(9.)

$23\frac{7}{12}$ × 6 = 138

$\frac{1}{2}$ × 6 = $3\frac{1}{2}$

12)42

Ans. $\$141\frac{1}{2}$

(10.)

$8\frac{3}{5}$ × 5 = 40

$\frac{1}{5}$ × 5 = $1\frac{1}{5}$

8)15

Ans. $\$ 41\frac{7}{8}$

(11.)

$\$ 6\frac{3}{8}$ × 9 = 54

$\frac{3}{8}$ × 9 = $3\frac{3}{8}$

8)27

Ans. $\$ 57\frac{3}{8}$

(12.)

$\$\,6\ 37\frac{1}{2}$ | 1
12 | 12
76.44 | $2)12$
6 | 6
Ans. $\$\,76.50$

(13.)

$\$\,9\frac{3}{8}$ | 3
11 | 11
99 | $8)33$
$4\frac{1}{8}$ | $4\frac{1}{8}$
Ans. $\$\,103\frac{1}{8}$

(14.)

$4\frac{3}{8}$ | 3
$\$\,1.75$ | $\$\,1.75$
7.00 | $8)525$
$.65\frac{5}{8}$ | $.65\frac{5}{8}$
Ans. $\$7.65\frac{5}{8}$

(15.)

$\$\,11\frac{7}{8}$ | 7
7 | 7
77 | $8)49$
$6\frac{1}{8}$ | $6\frac{1}{8}$
Ans. $\$\,83\frac{1}{8}$

(16.)

$\$\,10\frac{5}{8}$ | 5
9 | 9
90 | $8)45$
$5\frac{5}{8}$ | $5\frac{5}{8}$
Ans. $95\frac{5}{8}$

(17.)

$\$\,3\frac{1}{8}$ | 1
5 | 5
15 | 5
$0\frac{5}{8}$ | $\frac{5}{8}$
Ans. $\$\,15\frac{5}{8}$

(18.)

$\$\,7.62\frac{1}{2}$ | 1
15 | 15
114.30 | $2)15$
$7\frac{1}{2}$ | $7\frac{1}{2}$
Ans. $\$\,114.37\frac{1}{2}$

(19.)

$\$\,8.37\frac{1}{2}$ | 1
40 | 40
334.80 | $2)40$
20 | 20
Ans. $\$\,335.00$

(Art. **156**, p. **158.**)

2. $\frac{7}{\cancel{8}} \times \frac{\cancel{8}}{11} = \frac{7}{11}$ Ans.

3. $\frac{\overset{1}{\cancel{5}}}{\cancel{11}} \times \frac{\cancel{11}}{\underset{4}{\cancel{20}}} = \frac{1}{4}$ Ans.

4. $\frac{\cancel{8}}{\cancel{13}} \times \frac{\cancel{13}}{\underset{3}{\cancel{24}}} = \frac{1}{3}$ Ans.

5. $\frac{\cancel{18}}{\cancel{19}} \times \frac{\cancel{19}}{\underset{5}{\cancel{90}}} = \frac{1}{5}$ Ans.

6. $\frac{\cancel{15}}{\cancel{17}} \times \frac{\cancel{17}}{\underset{4}{\cancel{60}}} = \frac{1}{4}$ Ans.

7. $\frac{1}{9} \times \frac{8}{17} = \frac{8}{153}$ Ans.

8. $\frac{\cancel{6}}{\cancel{23}} \times \frac{\cancel{23}}{\underset{6}{\cancel{36}}} = \frac{1}{6}$ Ans.

9. $\frac{7}{\cancel{8}} \times \frac{\cancel{8}}{9} = \frac{7}{9}$ Ans.

10. $\frac{\cancel{8}}{\cancel{11}} \times \frac{\cancel{11}}{\underset{4}{\cancel{32}}} = \frac{1}{4}$ Ans.

11. $\frac{7}{10} \times \frac{3}{4} = \frac{21}{40}$ Ans.

12. $\frac{\cancel{2}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{8}_{4}} = \frac{1}{4}$; $\frac{7}{\cancel{9}} \times \frac{\cancel{9}}{11} = \frac{7}{11}$; $\frac{1}{4} \times \frac{7}{11} = \frac{7}{44}$ Ans.

13. $\frac{3}{\cancel{9}} \times \frac{4}{7} \times \frac{\cancel{9}}{11} = \frac{12}{77}$; $\frac{2}{\cancel{3}} \times \frac{\cancel{6}}{\cancel{18}_{1}} = \frac{12}{1}$; $\frac{12}{77} \times \frac{12}{1} = \frac{144}{77} = 1\frac{67}{77}$ [Ans.

(ART. **157**, p. **159.**)

2. $7\frac{1}{8} \times 8\frac{3}{7} = \frac{57}{8} \times \frac{59}{7} = \frac{3363}{56} = 60\frac{3}{56}$ Ans.

3. $4\frac{7}{8} \times 9\frac{1}{4} = \frac{39}{8} \times \frac{37}{4} = \frac{1443}{32} = 45\frac{3}{32}$ Ans.

4. $11\frac{2}{7} \times 8\frac{4}{5} = \frac{79}{7} \times \frac{44}{5} = \frac{3476}{35} = 99\frac{11}{35}$ Ans.

5. $12\frac{3}{4} \times 11\frac{5}{9} = \frac{\overset{17}{\cancel{51}}}{\cancel{4}} \times \frac{\overset{26}{\cancel{104}}}{\cancel{9}_{3}} = \frac{442}{3} = 147\frac{1}{3}$ Ans.

6. $7\frac{3}{4} \times 5\frac{3}{8} = \frac{31}{4} \times \frac{43}{8} = \frac{1333}{32} = \$41\frac{21}{32}$ Ans.

7. $7\frac{3}{8} \times 3\frac{1}{2} = \frac{59}{8} \times \frac{7}{2} = \frac{413}{16} = \$25\frac{13}{16}$ Ans.

8. $6\frac{3}{7} \times 23\frac{3}{4} = \frac{45}{7} \times \frac{95}{4} = \frac{4275}{28} = \$1.52\frac{19}{28}$ Ans.

9. $3\frac{4}{5} \times 9\frac{7}{8} = \frac{31}{9} \times \frac{79}{8} = \frac{2449}{72} = 34\frac{1}{72}$ miles, Ans.

10. $361\frac{11}{40} \times 25\frac{3}{8} = \frac{14451}{40} \times \frac{203}{8} = \frac{2933553}{320} = \$9167\frac{113}{320}$ Ans.

11. $97\frac{5}{16} \times 49\frac{3}{7} = \frac{1557}{\cancel{16}_{8}} \times \frac{\overset{173}{\cancel{346}}}{7} = \frac{269361}{56} = 4810\frac{1}{56}$rd. Ans.

(ART. **159**, p. **161.**)

3. $\frac{6 \div 3}{13} = \frac{2}{13}$ Ans.

4. $\frac{18 \div 6}{19} = \frac{3}{19}$ Ans.

5. $\frac{7}{11} \times 12 = \frac{7}{132}$ Ans.

6. $\frac{11}{12} \times 8 = \frac{11}{96}$ Ans.

7. $\frac{27 \div 9}{43} = \frac{3}{43}$ Ans.

8. $\frac{75 \div 15}{98} = \frac{5}{98}$ Ans.

9. $\frac{450 \div 75}{533} = \frac{6}{533}$ Ans.

10. $\frac{7}{9} \times 12 = \frac{7}{108}$ Ans.

11. $\frac{5 \div 5}{7} = \frac{1}{7}$ Ans.

12. $\frac{\overset{3}{\cancel{9}}}{23 \times \underset{5}{\cancel{15}}} = \frac{3}{115}$ Ans.

13. $\frac{\overset{3}{\cancel{6}}}{17 \times \underset{14}{\cancel{28}}} = \frac{3}{238}$ Ans.

14. $\frac{7}{7} - \frac{2}{7} = \frac{5}{7}$; $\frac{5}{7} \times \frac{1}{3} = \frac{5}{21}$; $\frac{5}{7} - \frac{5}{21} = \frac{10}{21}$; $\frac{10}{21} \div \frac{7}{1} = \frac{10}{147}$; \$10,000 $\div \frac{10}{147} =$ \$680$\frac{40}{147}$ Ans.

2. (Art. **160**, p. **161**.) $18 \times 8 = 144$; $144 \div 7 = 20\frac{4}{7}$ Ans.
3. $27 \times 12 = 324$; $324 \div 11 = 29\frac{5}{11}$ Ans.
4. $23 \times 4 = 92$; $92 \div 1 = 92$ Ans.
5. $5 \times 5 = 25$; $25 \div 1 = 25$ Ans.
6. $12 \times 4 = 48$; $48 \div 3 = 16$ Ans.
7. $16 \times 2 = 32$; $32 \div 1 = 32$ Ans.
8. $100 \times 19 = 1900$; $1900 \div 17 = 111\frac{13}{17}$ Ans.
9. $50 \times 5 = 250$; $250 \div 3 = 83\frac{1}{3}$ Ans.
10. $60 \times 11 = 660$; $660 \div 9 = 73\frac{1}{3}$ minutes, Ans.

2. (Art. **161**, p. **162**.) $17\frac{3}{5} \div 7 = 2\frac{18}{35}$ Ans.
3. $18\frac{3}{7} \div 8 = 2\frac{17}{56}$ Ans.
4. $27\frac{11}{12} \div 9 = 3\frac{11}{108}$ Ans.
5. $31\frac{1}{10} \div 11 = 2\frac{91}{110}$ Ans.
6. $78\frac{4}{5} \div 12 = 6\frac{34}{60} = 6\frac{17}{30}$ Ans.
7. $189\frac{11}{15} \div 4 = 47\frac{13}{30}$ Ans.
8. $107\frac{1}{12} \div 3 = 35\frac{25}{36}$ Ans.
9. \$$14\frac{3}{7} \div 7 =$ \$$2\frac{3}{49}$ Ans.
10. $106\frac{7}{9} \div 8 =$ \$$13\frac{25}{72}$ Ans.
11. $100 \times 25 = 2500$; $2500 \div 72 =$ \$$0.34\frac{13}{18}$ Ans.
12. $3 \times 2 = 6$; $6 + 4 = 10$; $107\frac{7}{11} \div 10 =$ \$$10\frac{42}{55}$, boy's share; \$$10\frac{42}{55} \times 2 =$ \$$21\frac{29}{55}$, girl's share, Ans.
13. $\frac{17}{20}$ of a ton is 17cwt.; and, if 17cwt. be divided by 14, the quotient will be $1\frac{3}{14}$cwt. Ans.

2. (Art. **162**, p. **163**.) $36 \times 8 = 288$; $9\frac{7}{8} \times 8 = 79$; $288 \div 79 = 3\frac{51}{79}$ Ans.
3. $97 \times 12 = 1164$; $13\frac{11}{12} \times 12 = 167$; $1164 \div 167 = 6\frac{162}{167}$ Ans.
4. $113 \times 7 = 791$; $21\frac{1}{7} \times 7 = 148$; $791 \div 148 = 5\frac{51}{148}$ Ans.

5. $342 \times 131 = 44802$; $14\frac{47}{131} \times 131 = 1881$; $44802 \div 1881 = 23\frac{159}{1881} = 23\frac{9}{11}$ Ans.

6. $19 \times 7 = 133$; $2\frac{3}{7} \times 7 = 17$; $133 \div 17 = 7\frac{14}{17}$ pieces;

$$\frac{14}{17} \times 2\frac{3}{7} = \frac{\overset{2}{\cancel{14}}}{\cancel{17}} \times \frac{\cancel{17}}{7} = \frac{2}{1} = 2\text{ft. Ans.}$$

(ART. **163**, p. **164.**)

2. $\frac{7}{9} \times \frac{7}{4} = \frac{49}{36} = 1\frac{13}{36}$ Ans.

3. $\frac{\overset{7}{\cancel{8}}}{\underset{2}{}} \times \frac{4}{1} = \frac{7}{2} = 3\frac{1}{2}$ Ans.

4. $\frac{13}{\cancel{15}} \times \frac{\overset{4}{\cancel{12}}}{11} = \frac{52}{55}$ Ans.

5. $\frac{2}{3} \times \frac{10}{3} = \frac{20}{9} = 2\frac{2}{9}$ Ans.

6. $\frac{9}{10} \times \frac{7}{1} = \frac{63}{10} = 6\frac{3}{10}$ Ans.

7. $\frac{\overset{2}{\cancel{4}}}{5} \times \frac{11}{\cancel{2}} = \frac{22}{5} = 4\frac{2}{5}$ Ans.

8. $\frac{\overset{3}{\cancel{9}}}{\cancel{13}} \times \frac{\overset{2}{\cancel{26}}}{3} = \frac{6}{1} = 6$ Ans.

9. $\frac{19}{\cancel{20}} \times \frac{\cancel{20}}{7} = \frac{19}{7} = 2\frac{5}{7}$ Ans.

10. $\frac{\cancel{2}}{3} \times \frac{7}{\underset{4}{\cancel{8}}} = \frac{7}{12}$; $\frac{1}{7} \times \frac{2}{9} = \frac{2}{63}$; $\frac{7}{\cancel{12}} \times \frac{\overset{21}{\cancel{63}}}{2} = \frac{147}{8} = 18\frac{3}{8}$ Ans.

11. $\frac{\cancel{4}}{\underset{3}{\cancel{9}}} \times \frac{\overset{2}{\cancel{6}}}{11} \times \frac{7}{\underset{2}{\cancel{16}}} = \frac{7}{66}$; $\frac{2}{3} \times \frac{7}{\underset{2}{\cancel{4}}} \times \frac{1}{9} = \frac{7}{54}$; $\frac{\cancel{7}}{\underset{11}{\cancel{66}}} \times \frac{\overset{9}{\cancel{54}}}{\cancel{7}} = \frac{9}{11}$ [Ans.

12. $\frac{\cancel{3}}{\cancel{4}} \times \frac{5}{7} \times \frac{\cancel{4}}{\underset{3}{\cancel{9}}} = \frac{5}{21}$; $\frac{2}{\cancel{3}} \times \frac{\overset{2}{\cancel{6}}}{7} \times \frac{2}{\underset{9}{\cancel{18}}} = \frac{4}{63}$; $\frac{5}{\cancel{21}} \times \frac{\overset{3}{\cancel{63}}}{4} = \frac{15}{4} =$ [$3\frac{3}{4}$ Ans.

2. (ART. **164.**) $7\frac{3}{8} = \frac{59}{8}$; $4\frac{1}{2} = \frac{9}{2}$; $\frac{\overset{59}{\cancel{8}}}{\underset{4}{}} \times \frac{2}{9} = \frac{59}{36} = 1\frac{23}{36}$ Ans.

3. $3\frac{1}{2} = \frac{7}{2}$; $7\frac{1}{2} = \frac{15}{2}$; $\frac{7}{\cancel{2}} \times \frac{\cancel{2}}{15} = \frac{7}{15}$ Ans.

4. $11\frac{1}{4} = \frac{45}{4}$; $5\frac{3}{7} = \frac{38}{7}$; $\frac{45}{4} \times \frac{7}{38} = \frac{315}{152} = 2\frac{11}{152}$ Ans.

5. $4\frac{3}{7} = \frac{31}{7}$; $1\frac{7}{9} = \frac{16}{9}$; $\frac{31}{7} \times \frac{9}{16} = \frac{279}{112} = 2\frac{55}{112}$ Ans.

6 $116\frac{3}{7} = \frac{815}{7}$; $14\frac{1}{7} = \frac{99}{7}$; $\frac{815}{7} \times \frac{7}{99} = \frac{815}{99} = 8\frac{23}{99}$ Ans.

7. $81\frac{1}{7} = \frac{568}{7}$; $9\frac{1}{5} = \frac{46}{5}$; $\frac{\overset{284}{\cancel{568}}}{7} \times \frac{5}{\cancel{46}_{23}} = \frac{1420}{161} = 8\frac{132}{161}$ Ans.

8. $\frac{3}{5} \times \frac{11}{2} \times \frac{7}{1} = \frac{231}{10}$; $\frac{\cancel{5}}{8} \times \frac{33}{\cancel{10}_{2}} = \frac{33}{16}$; $\frac{\overset{7}{\cancel{231}}}{\cancel{10}_{5}} \times \frac{8}{\cancel{16}_{33}} = \frac{56}{5} = 11\frac{1}{5}$ [Ans.

(ART. **165**, p. **165**.)

(4.)

$$\frac{12}{\frac{3}{7}} = \frac{\overset{4}{\cancel{12}}}{1} \times \frac{7}{\cancel{3}} = \frac{28}{1} = 28 \text{ Ans.}$$

(5.)

$$\frac{\frac{3}{7}}{14} = \frac{3}{7} \times \frac{1}{14} = \frac{3}{98} \text{ Ans.}$$

(6.)

$$\frac{47}{9} = \frac{\overset{13}{\cancel{39}}}{8} \times \frac{1}{\cancel{9}_{3}} = \frac{13}{24} \text{ Ans.}$$

(7.)

$$\frac{\frac{3}{4}}{\frac{11}{12}} = \frac{3}{\cancel{4}} \times \frac{\overset{3}{\cancel{12}}}{11} = \frac{9}{11} \text{ Ans.}$$

(8.)

$$\frac{\frac{5}{6}}{7\frac{3}{4}} = \frac{5}{\cancel{6}_{3}} \times \frac{\overset{2}{\cancel{4}}}{31} = \frac{10}{93} \text{ Ans.}$$

(9.)

$$\frac{8\frac{3}{4}}{\frac{2}{5}} = \frac{35}{4} \times \frac{5}{2} = \frac{175}{8} = 21\frac{7}{8} \text{ Ans.}$$

(10.)

$$\frac{9\frac{3}{5}}{12\frac{1}{2}} = \frac{48}{5} \times \frac{2}{25} = \frac{96}{125} \text{ Ans.}$$

(11.)

$$\frac{\frac{9\frac{1}{4}}{12\frac{7}{8}}}{7} = \frac{37}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{103} \times \frac{1}{7} = \frac{74}{721} \text{ Ans.}$$

(12.)

$$\frac{\frac{3}{4}}{\frac{8}{9}} = \frac{3}{4} \times \frac{9}{8} \times \frac{1}{2} = \frac{27}{64} \text{ Ans.}$$

(ART. **166**, p. **166**.)

1. $\frac{\frac{1}{3}}{\frac{3}{7}} = \frac{1}{3} \times \frac{7}{3} = \frac{7}{9}$; $\frac{4\frac{1}{7}}{12\frac{1}{2}} = \frac{29}{7} \times \frac{2}{25} = \frac{58}{175}$; $\frac{7}{9} + \frac{58}{175} = \frac{1225}{1575}$
$+ \frac{522}{1575} = \frac{1747}{1575} = 1\frac{172}{1575}$ Ans.

2. $\frac{7\frac{3}{4}}{\frac{4}{7}} = \frac{31}{4} \times \frac{7}{4} = \frac{217}{16}$; $\frac{7}{\frac{7}{12}} = \frac{7}{1} \times \frac{12}{7} = \frac{12}{1}$; $\frac{217}{16} + \frac{12}{1} = \frac{217}{16} + \frac{192}{16} = \frac{409}{16} = 25\frac{9}{16}$ Ans.

3. $\frac{\frac{3}{7}}{8\frac{1}{2}} = \frac{3}{7} \times \frac{2}{17} = \frac{6}{119}$; $\frac{1}{8} \times \frac{2}{3} = \frac{2}{81}$; $\frac{6}{119} - \frac{2}{81} = \frac{486}{9639} - \frac{238}{9639} = \frac{248}{9639}$ Ans.

4. $\frac{6\frac{3}{4}}{\frac{3}{4}} = \frac{27}{4} \times \frac{4}{3} = \frac{9}{1}$; $\frac{1}{9} = \frac{1}{9} \times \frac{8}{8} = \frac{8}{72}$; $\frac{9}{1} - \frac{8}{27} = \frac{243}{27} - \frac{8}{27} = \frac{235}{27} = 8\frac{19}{27}$ Ans.

5. $\frac{3}{4} \times \frac{8\frac{4}{5}}{6\frac{2}{5}} \times \frac{4}{3} \times \frac{7}{16}$; $\frac{8\frac{4}{5}}{6\frac{2}{5}} = \frac{44}{5} = \frac{44}{5} \times \frac{5}{32} = \frac{11}{8}$; $\frac{7}{16} = \frac{7}{2} \times \frac{1}{8} = \frac{1}{56}$; $\frac{3}{4} \times \frac{11}{8} \times \frac{4}{9} \times \frac{1}{56} = \frac{11}{1344}$ Ans.

6. $\frac{3\frac{1}{2}}{5\frac{3}{4}} = \frac{7}{2} \times \frac{4}{23} = \frac{14}{23}$; $\frac{6\frac{1}{4}}{2\frac{4}{5}} = \frac{25}{4} \times \frac{5}{22} = \frac{225}{88}$; $\frac{225}{88} \times \frac{7}{23} = \frac{1575}{1012} = 1\frac{563}{1012}$ Ans.

7. $\frac{\frac{7}{8}}{11} \times 12\frac{1}{2} = \frac{7}{8} \times \frac{1}{3} \times \frac{25}{2} = \frac{175}{48}$; $\frac{\frac{1}{3}}{7\frac{1}{2}} \times 8\frac{3}{4} = \frac{1}{3} \times \frac{2}{15} \times \frac{35}{4} = \frac{7}{18}$; $\frac{275}{48} \times \frac{3}{7} = \frac{825}{336} = 103\frac{1}{8}$ Ans.

(ART. **167**, p. **167.**)

2. $\frac{3}{4}$, $\frac{5}{6}$, $1\frac{1}{8} = \frac{3}{4}$, $\frac{5}{6}$, $\frac{9}{8}$.
Greatest common divisor of $3, 5, 9 = 1$
Least common multiple of $4, 6, 8 = 24$ Ans.

3. Greatest common divisor of $12, 4, 8, 16 = 4$
Least common multiple of $13, 7, 21, 39 = 273$ Ans.

4. $\frac{15}{16}$, $2\frac{1}{4}$, 4, $5\frac{1}{3} = \frac{15}{16}$, $\frac{9}{4}$, $\frac{4}{1}$, $\frac{16}{3}$.
Greatest common divisor of $\overline{15, 9, 4, 16} = 1$
Least common multiple of $\overline{16, 4, 1, 3} = 48$ Ans.

5. $166\frac{2}{3}$, $156\frac{1}{4}$, $208\frac{1}{3} = \frac{500}{3}$, $\frac{625}{4}$, $\frac{625}{3}$.
Greatest common divisor of $\overline{500, 625, 625} = 125$
Least common multiple of $\overline{3, 4, 3} = 12 = 10\frac{5}{12}$.
$10\frac{5}{12} + \frac{1}{2} = 10\frac{11}{12}$ feet. Ans.

(ART. **168**, p. **167**.)

2. Least common multiple of $\overline{10, 6, 15} = 30$
Greatest common divisor of $\overline{28, 7, 35} = 7 = 4\frac{2}{7}$ Ans.

3. $\frac{1}{15}$, $2\frac{1}{2}$, 5, $6\frac{1}{3}$, $\frac{1}{11} = \frac{1}{15}$, $\frac{5}{2}$, $\frac{5}{1}$, $\frac{19}{3}$, $\frac{1}{11}$.
Least common multiple of $\overline{1, 5, 5, 19, 1} = 95$
Greatest common divisor of $\overline{15, 2, 1, 3, 11} = 1 = 95$ Ans

4. $\frac{5}{16}$, $\frac{5}{8}$, $1\frac{1}{2}$, $2\frac{1}{4} = \frac{5}{16}$, $\frac{5}{8}$, $\frac{3}{2}$, $\frac{9}{4}$.
Least common multiple of $\overline{5, 5, 3, 9} = 45$
Greatest common divisor of $\overline{16, 8, 2, 4} = 2 = \$\,22\frac{1}{2}$ Ans.
$\frac{45}{2} \div \frac{5}{16} = 72$ bushels of oats. $\frac{45}{2} \div \frac{5}{8} = 36$ bushels of corn.
$\frac{45}{2} \div \frac{3}{2} = 15$ bushels of rye. $\frac{45}{2} \div \frac{9}{4} = 10$ bushels of wheat.

5. Least common multiple of $\overline{3, 7} = 21$
Greatest common divisor of $\overline{4, 8} = 4 = 5\frac{1}{4}$ days.
$10 \div \frac{3}{4} = \frac{40}{3}$; $\frac{40}{3} \times \frac{21}{4} = \frac{840}{12} = 70$ miles A.
$10 \div \frac{7}{6} = \frac{60}{7}$; $\frac{60}{7} \times \frac{21}{4} = \frac{1260}{28} = 60$ miles B.

MISCELLANEOUS EXERCISES IN VULGAR FRACTIONS.

(PAGE **169**.)

1. $76\frac{7}{25} = \frac{1907}{25}$; $18\frac{3}{4} = \frac{75}{4}$; $\frac{1907}{25} \times \frac{\overset{3}{75}}{4} = \frac{5721}{4} = 1430\frac{1}{4}$p
$= 8$A. 3R. $30\frac{1}{4}$p. Ans.

2. $7\frac{3}{4} = \frac{31}{4}$; $1\frac{3}{4} = \frac{7}{4}$; $1\frac{1}{4} = \frac{5}{4}$; $\frac{31}{4} \times \frac{7}{4} \times \frac{5}{4} \times \frac{\overset{5}{\cancel{10}}}{1} = \frac{5425}{32} =$ $169\frac{17}{32}$ cubic feet, Ans.

3. $\frac{7}{11}$ of an acre = 2R. 21p. $222\frac{2}{4}$ft. From this we subtract 20p. 200ft.; and there remain 2R. 1p. $22\frac{2}{4}$ft. = 22075ft. Ans.

4. $\frac{11}{13} \times \frac{160}{1} \times \frac{175}{1} = \frac{308000}{13} = \$236.92\frac{4}{13}$ Ans.

5. $15\frac{3}{4} = \frac{63}{4}$; $\frac{3}{19} \times \frac{\overset{5}{\cancel{20}}}{1} \times \frac{63}{4} = \frac{945}{19} = \$49.73\frac{13}{19}$.

6. $14\frac{2}{5} = \frac{72}{5}$; $11\frac{3}{7} = \frac{80}{7}$; $5\frac{4}{5} = \frac{29}{5}$; $10\frac{1}{4} = \frac{41}{4}$; $\frac{\overset{8}{\cancel{72}}}{5} \times \frac{\overset{4}{\cancel{80}}}{\underset{7}{\cancel{7}}} \times \frac{\overset{7}{\cancel{49}}}{9} \times \frac{41}{\underset{1}{\cancel{4}}} = 9184$ Ans.

7. $\frac{7}{7} - \frac{4}{7} = \frac{3}{7}$; $\frac{7}{12} \times \frac{3}{7} = \frac{21}{84} = \frac{1}{4}$; $\frac{1}{4} \times \frac{100}{1} = 25$lb.; $\$0.12\frac{3}{4} \times 25 = \$3.18\frac{3}{4}$ Ans.

8. $19\frac{3}{7} = \frac{136}{7}$; $7\frac{3}{8} = \frac{59}{8}$; $\frac{\overset{17}{\cancel{136}}}{7} \times \frac{59}{8} = \frac{1003}{7} = \$143\frac{2}{7}$ Ans.

9. $47\frac{5}{11} = \frac{522}{11}$; $29\frac{7}{16} = \frac{471}{16}$; $\frac{\overset{261}{\cancel{522}}}{11} \times \frac{471}{\underset{8}{\cancel{16}}} = \frac{122931}{88} = 1396\frac{83}{88}$ square rods; $5 \times 5 = 25$; $25 + 5 = 30$; $1396\frac{83}{88} - 30 = 1366\frac{83}{88}$ square rods, Ans.

10. $175\frac{3}{5} = \frac{878}{5}$; $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$; $\frac{878}{5} \times \frac{2}{5} = \frac{1756}{25}$; $\frac{3}{3} - \frac{2}{3} = \frac{1}{3}$; $\frac{1756}{25} \times \frac{1}{3} = \frac{1756}{75}$; $8\frac{3}{4} = \frac{35}{4}$; $\frac{\overset{439}{\cancel{1756}}}{\underset{15}{\cancel{75}}} \times \frac{\overset{7}{\cancel{35}}}{4} = \frac{3073}{15} =$ $\$2.04\frac{13}{15}$ Ans.

11. $475 \div 3 = 158\frac{1}{3}$; $158\frac{1}{3} \times .08 = \$\,12.66\frac{2}{3}$; $475 - 158\frac{1}{3} = 316\frac{2}{3}$; $\frac{2}{3} \times 316\frac{2}{3} = 211\frac{1}{9}$; $211\frac{1}{9} \times .10 = \$\,21.11\frac{1}{9}$; $316\frac{2}{3} - 211\frac{1}{9} = 105\frac{5}{9}$; $105\frac{5}{9} \times .12\frac{1}{2} = \$\,13.19\frac{4}{9}$ Ans. $\$\,21.11\frac{1}{9} + \$12.66\frac{2}{3} + \$\,13.19\frac{4}{9} = \$\,46.97\frac{7}{9}$; $\$\,46.97\frac{7}{9} - \$\,30.00 = \$\,16.97\frac{7}{9}$, Green's bargain, Ans.

12. $14\frac{3}{7} = \frac{101}{7}$; $\frac{\overset{2}{\cancel{14}}}{\cancel{101}} \times \frac{\cancel{101}}{\cancel{7}} = \$\,2.00$ Ans.

13. $\frac{\cancel{7}}{\cancel{8}} \times \frac{\cancel{8}}{\cancel{11}} \times \frac{\cancel{11}}{\underset{2}{\cancel{14}}} = \frac{1}{2}$; $\frac{\cancel{5}}{\cancel{17}} \times \frac{\cancel{17}}{\cancel{19}} \times \frac{\cancel{19}}{\underset{5}{\cancel{25}}} = \frac{1}{5}$; $\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$ Ans.

14. $11\frac{3}{4} = \frac{47}{4}$; $4\frac{1}{4} = \frac{17}{4}$; $\frac{47}{4} \times \frac{17}{4} = \frac{799}{16} = 49\frac{15}{16}$ sq. in. Ans.

15. $\$\,17.87\frac{1}{2} \div 2 = \$\,8.93\frac{3}{4}$. Now, if $\frac{2}{5}$ of this sum were given to the Bible Society, $\frac{3}{5}$ of it will remain; therefore, $\$\,8.93\frac{3}{4} \times \frac{3}{5} = \$\,3.57\frac{1}{2}$ Ans.

16. $10\frac{4}{5} = \frac{54}{5}$; $50 \times 5 = 250$; $250 \div 54 = 4\frac{17}{27}$; $12\frac{3}{4} - 4\frac{17}{27} = 8\frac{13}{108}$ Ans.

17. $7\frac{3}{8} = \frac{59}{8}$; $20 \times 8 = 160$; $160 \div 59 = 2\frac{42}{59}$ Ans.

18. $8\frac{5}{12} = \frac{101}{12}$; $3\frac{11}{12} = \frac{47}{12}$; $2\frac{1}{12} = \frac{25}{12}$; $\frac{101}{12} \times \frac{47}{12} \times \frac{25}{12} = \frac{118675}{1728} = 68\frac{1171}{1728}$ feet, Ans.

19. If $\frac{2}{3}$ of this field be planted with corn, $\frac{1}{3}$ of the field will remain unplanted. And, if $\frac{2}{3}$ of this remainder be sown with wheat, then there will remain $\frac{1}{9}$ of the whole field; because, if $\frac{2}{3}$ of $\frac{1}{3} = \frac{2}{9}$ be taken from $\frac{1}{3}$, the remainder will be $\frac{1}{9}$; thus, $\frac{1}{3} = \frac{3}{9} - \frac{2}{9} = \frac{1}{9}$. If, then, $\frac{3}{7}$ of this $\frac{1}{9}$ be planted with potatoes, $\frac{4}{7}$ of the $\frac{1}{9}$ will remain; and $\frac{4}{7}$ of $\frac{1}{9}$ is $\frac{4}{63}$. That is, the 3 rods square and the 3 square rods are $\frac{4}{63}$ of the whole field; but 3 rods square are 9 square rods; and if to these we add the 3 square rods, the whole amount will be 12 square rods. If, then, 12 square rods be $\frac{4}{63}$ of the field, 3 square rods will be $\frac{1}{63}$ of the field; and, if $\frac{1}{63}$ of the field be 3 rods, $\frac{63}{63}$, or the whole field, will be 63 times as much, that is, $63 \times 3 = 189$ square rods $= 1$A. 0R. 29p. Ans.

2. (ART. **169**, p. **171**.) $\frac{1}{\cancel{1400}\ \cancel{70}\ 35} \times \frac{\cancel{20}}{1} \times \frac{12}{1} \times \frac{\overset{2}{\cancel{4}}}{1} = \frac{24}{35}$ Ans.

3. $\frac{4}{\cancel{75}\ 25} \times \frac{\overset{4}{\cancel{12}}}{1} = \frac{16}{25}$ Ans.

4. $\frac{1}{\cancel{8640}\ \cancel{720}\ \cancel{36}\ 3} \times \frac{\cancel{12}}{1} \times \frac{\cancel{20}}{1} \times \frac{\overset{2}{\cancel{24}}}{1} = \frac{2}{3}$ Ans.

5. $\frac{1}{\cancel{1728}\ \cancel{432}\ 27} \times \frac{\cancel{4}}{1} \times \frac{25}{1} \times \frac{\cancel{16}}{1} = \frac{28}{27} = \frac{25}{27}$ Ans.

6. $\frac{1}{\cancel{1320}\ \cancel{33}\ 2} \times \frac{\cancel{40}}{1} \times \frac{\cancel{16}\frac{1}{2}}{1} = \frac{1}{2}$ Ans.

7. $\frac{1}{\cancel{59080}\ 363} \times \frac{\cancel{160}}{1} \times \frac{272\frac{1}{4}}{1} = \frac{272\frac{1}{4}}{363} = \frac{1089}{1452} = \frac{3}{4}$ Ans

8. $\frac{1}{\cancel{89600}\ \cancel{11200}\ 28} \times \frac{\overset{3}{\cancel{24}}}{1} \times \frac{\overset{3}{\cancel{60}}}{1} \times \frac{\overset{3}{\cancel{60}}}{1} = \frac{27}{28}$ Ans.

9. $\frac{3}{\cancel{14}\ 7} \times \frac{\overset{2}{\cancel{4}}}{1} = \frac{6}{7}$ Ans.

10. $\frac{1}{\cancel{200}\ \cancel{50}\ 2} \times \frac{\cancel{4}}{1} \times \frac{\cancel{25}}{1} = \frac{1}{2}$ Ans.

2. (ART. **170**, p. **171.**) $\frac{\cancel{4}}{7} \times \frac{1}{\cancel{24}\,6} \times \frac{1}{20} \times \frac{1}{12} = \frac{1}{10080}$ Ans.

3. $\frac{\cancel{3}}{10} \times \frac{1}{\cancel{3}} \times \frac{1}{8} = \frac{1}{80}$ Ans.

4. $\frac{\cancel{4}}{5} \times \frac{1}{\cancel{16}\,4} \times \frac{1}{25} \times \frac{1}{\cancel{4}} \times \frac{1}{20} = \frac{1}{4000}$ Ans.

5. $\frac{\cancel{8}}{9} \times \frac{1}{40} \times \frac{1}{\cancel{8}} = \frac{1}{360}$ Ans.

6. $\frac{\cancel{2}}{3} \times \frac{1}{272\frac{1}{\cancel{4}}} \times \frac{1}{40} \times \frac{1}{\cancel{4}\,2} = \frac{1}{65340}$ Ans.

7. $\frac{\cancel{24}}{25} \times \frac{1}{60} \times \frac{1}{60} \times \frac{1}{\cancel{24}} = \frac{1}{90000}$ Ans.

8. $\frac{\cancel{4}}{9} \times \frac{1}{272\frac{1}{\cancel{4}}} \times \frac{1}{40} \times \frac{1}{\cancel{4}} \times \frac{1}{\cancel{3}} = \frac{1}{2940\,30}$ Ans.

9. $\frac{\cancel{4}}{7} \times \frac{1}{\cancel{4}} \times \frac{1}{63} \times \frac{1}{3} = \frac{1}{1323}$ Ans.

10. A solid foot contains 1728 cubic inches, and $\frac{1}{6}$ of 1728 is 288. One sixth of a yard is 6 inches, and a cube whose sides measure 6 inches each contains $6 \times 6 \times 6 = 216$ cubic inches, and 216 is $\frac{3}{4}$ of 288; thus, $\frac{216}{288} = \frac{3}{4}$ Ans.

(ART. **171**, p. **173.**)

(2.)

7
4
9)28(3qr.
27
1
25
9)25(2lb.
18
7
16
9)112(12oz.
9
22
18
4
16
9)64(7$\frac{1}{9}$dr.
63
1

(3.)

7
4
9)28(3qr.
27
1
4
9)4(0$\frac{4}{9}$na.

(4.)

3
4
7)12(1R.
7
5
40
7)200(28p.
14
60
56
4
272$\frac{1}{4}$
1089
(Carried up.)

(Brought up.)

7)1089(155ft.
7
38
35
39
35
4
144
7)576(82$\frac{2}{7}$in.
56
16
14
2

(5.)

2
8
9)16(1fur.
9
7
40
9)280(31rd.
27
10
9
1
16$\frac{1}{2}$
9)16$\frac{1}{2}$(1ft.
9
7$\frac{1}{2}$ (Carried up.)
6

(6.)

3
5
11)15(1qr.
11
4
4
11)16(1$\frac{5}{11}$na.
11
5
(Brought up.)
7$\frac{1}{2}$
12
9)90(10in.
90

(7.)

2
63
7)126(18gal.
7
56
56

[illegible]

4 (Brought up.)

[illegible]

1

4 Carried up.

Art. 172, p. 173.

(2.)	(3.)
4s. 8d. = 56 / 1£. = 240 = $\frac{7}{30}$ Ans.	4cwt. 3qr. 12lb. = 487 / 1T. = 2000 Ans.

(4.)	(5.)
2 fur. 30rd. = 110 / 2m. 3 fur. 20rd. = 780 = $\frac{11}{78}$ Ans.	3R. 24p. = 144 / 2A. 2R. 32p. = 432 = $\frac{1}{3}$ Ans.

(6.)	(7.)
18gal. 2qt. = 74 / 1hhd. = 252 = $\frac{37}{126}$ Ans.	8d. 17h. 20m. = 12560 / 30d. = 43200 = $\frac{157}{540}$ Ans.

(8.)	(9.)
5yd. 2qr. 2na. = 90 / 13yd. 0qr. 2na. = 210 = $\frac{3}{7}$ Ans.	3yd. = 3 / 3yd. × 3 = 9 = $\frac{1}{3}$ Ans.

(Art. 173, p. 174.)

(2.)

	s.	d.	far.
$\frac{4}{11}$£. =	7	8	$1\frac{1}{11}$
$\frac{4}{7}$s. =		8	$2\frac{2}{7}$
Ans.	7	11	$8\frac{2}{7}$

(3.)

	T.	cwt.	qr.	lb.
$\frac{10}{11}$T. =		18	0	$18\frac{2}{11}$
$\frac{7}{9}$T. =		15	2	$5\frac{5}{9}$
$\frac{4}{7}$cwt. =			2	$7\frac{1}{7}$
Ans.	1	14	1	$5\frac{610}{693}$

(4.)

	yd.	qr.	na.	in.
$\frac{2}{3}$yd. =		2	2	$1\frac{1}{2}$
$\frac{3}{5}$yd. =		3	2	$0\frac{1}{2}$
$\frac{4}{11}$qr. =			1	$1\frac{1}{44}$
Ans.	1	2	2	$0\frac{17}{22}$

(5.)

	fur.	rd.	yd.	ft.	in
$\frac{4}{11}$m. =	2	36	2	0	0
$\frac{4}{5}$m. =	3	22	1	0	8
$\frac{3}{11}$fur. =		10	5	0	0
$\frac{7}{11}$yd. =				1	$10\frac{10}{11}$
	6	29	$2\frac{1}{2}$	2	$6\frac{10}{11}$
			$\frac{1}{2}$	=1	6
Ans.	6	29	3	1	$0\frac{10}{11}$

(6.)

	A.	R.	p.	ft.	in.
$\frac{9}{11}$A. =		3	10	247	72
$\frac{4}{5}$R. =			0	194	$66\frac{6}{7}$
$\frac{5}{7}$p. =			32	0	0
	1	0	3	$168\frac{3}{4}$	$138\frac{6}{7}$
				$\frac{3}{4}$	=108
Ans.	1	0	3	169	$102\frac{6}{7}$

(7.)

	R.	p.	ft.
$\frac{4}{17}$A. =	0	37	$176\frac{11}{68}$
$\frac{1}{7}$ A. =	0	22	$233\frac{5}{14}$
$\frac{2}{11}$A. =	0	29	$24\frac{3}{4}$
$\frac{3}{7}$ A. =	1	28	$155\frac{4}{7}$
Ans.	3	38	$45\frac{81}{238}$

(ART. 174, p. 175.)

(2.)

	cwt.	qr.	lb.
$\frac{4}{7}$T. =	11	1	$17\frac{6}{7}$
$\frac{6}{17}$cwt. =		1	$10\frac{5}{17}$
Ans.	11	0	$7\frac{67}{119}$

(3.)

	fur.	rd.	ft.	in.
$\frac{7}{8}$m. =	6	8	14	8
$\frac{7}{18}$fur. =		15	9	2
Ans.	5	33	5	6

(5.)

$\frac{3}{11}$ × 100gal. = 27 1 $0\frac{2}{11}$

$\frac{11}{11} - \frac{3}{11} = \frac{8}{11} \times \frac{2}{3} = \frac{16}{33}$ × 100gal. = 48 1 $1\frac{29}{33}$

75 3 $0\frac{2}{33}$

100 0 0

75 3 $0\frac{2}{33}$

Ans. 24 0 $1\frac{31}{33}$

(4.)

	R.	p.	ft.
$\frac{10}{11}$A. =	3	25	$123\frac{3}{4}$
$\frac{2}{5}$R. =		8	242
Ans.	3	16	154

(6.)

	m.	fur.	rd.	ft.	in.
41m. $\times \frac{3}{11}$	= 11	1	18	3	0
$\frac{11}{11} - \frac{3}{11} = \frac{8}{11} \times \frac{4}{7} = \frac{32}{77} \times$ 41m. =	17	0	12	7	$8\frac{4}{7}$
	28	1	30	10	$8\frac{4}{7}$
	41	0	0	0	0
	28	1	30	10	$8\frac{4}{7}$
Ans.	12	6	9	5	$9\frac{3}{7}$

(7.)

	da.	h.	m.	s.
365da. $\times \frac{4}{7}$	= 52	3	25	$42\frac{6}{7}$
$\frac{7}{7} - \frac{4}{7} = \frac{6}{7} \times \frac{3}{11} = \frac{18}{77} \times$ 365da. =	85	7	47	$31\frac{73}{77}$
Ans.	137	11	13	$14\frac{68}{77}$

(8.)

11A. 33p. $101\frac{1}{16}$ft. = $488245\frac{5}{16}$ft.;
$488245\frac{5}{16}$ft. $\times \frac{2}{3} \times \frac{2}{5} = 130198\frac{3}{4}$ft.;
$144 \times 144 \times 4 = 82944$ft.;
$130198\frac{3}{4} - 82944 = 47254\frac{3}{4}$ft.;
$47254\frac{3}{4} \times .08\frac{1}{3} = \$3937.89\frac{7}{12}$ Ans.

Questions Performed by Analysis.

2. (p. **176.**) $\$7.80 \div 10 = \$0.78$; $\$0.78 \times 3 = \$2.34$ Ans.
3. $\$17.84 \div 8 = \$2.23$; $\$2.23 \times 7 = \$15.61$ Ans.
4. $\$786.63 \div 13 = \$60.51$; $\$60.51 \times 11 = \$665.61$ Ans.
5. $\$87.50 \div 12 = \$7.29\frac{1}{6}$; $\$7.29\frac{1}{6} \times 11 = \$80.20\frac{5}{6}$ Ans.
6. 17£. 18s. 9d. $\div 4 =$ 4£. 9s. $8\frac{1}{4}$d.; 4£. 9s. $8\frac{1}{4}$d. $\times 3 =$ 13£. 9s. $0\frac{3}{4}$d. Ans.
7. 3T. 16cwt. 3qr. 23lb. $\div 7 =$ 10cwt. 3qr. $24\frac{5}{7}$lb.; 10cwt. 3qr. $24\frac{5}{7}$lb. $\times 4 =$ 2T. 3cwt. 3qr. $23\frac{6}{7}$lb. Ans.

8. 27A. 3R. 33p. $\div$ 9 = 3A. 0R. 17p.; 3A. 0R. 17p. $\times$ 4 = 12A. 1R. 28p. Ans.

10. \$ 2.34 $\div$ 3 = \$ 0.78; \$ 0.78 $\times$ 10 = \$ 7.80 Ans.

11. \$ 15.57$\frac{1}{2}$ $\div$ 7 = \$ 2.22$\frac{1}{2}$; \$ 2.22$\frac{1}{2}$ $\times$ 8 = \$ 17.80 Ans.

12. \$ 665.50 $\div$ 11 = \$ 60.50; \$ 60.50 $\times$ 13 = \$ 786.50 Ans.

13. \$ 73.60$\frac{5}{6}$ $\div$ 11 = \$ 6.69$\frac{1}{6}$; \$ 6.69$\frac{1}{6}$ $\times$ 12 = \$ 80.30 Ans.

14. 13£. 9s. 0$\frac{3}{4}$d. $\div$ 3 = 4£. 9s. 8$\frac{1}{4}$d.; 4£. 9s. 8$\frac{1}{4}$d. $\times$ 4 = 17£. 18s. 9d. Ans.

15. 18cwt. 0qr. 12lb. $\div$ 4 = 4cwt. 2qr. 3lb.; 4cwt. 2qr. 3lb. $\times$ 17 = 77cwt. 0qr. 1lb. Ans.

16. 12A. 1R. 30$\frac{7}{9}$p. $\div$ 4 = 3A. 0R. 17$\frac{29}{36}$p.; 3A. 0R. 17$\frac{29}{36}$p. $\times$ 9 = 27A. 3R. 39$\frac{1}{4}$p. Ans.

17. \$ 80.20$\frac{5}{6}$ $\div$ 11 = \$ 7.29$\frac{1}{6}$; \$ 7.29$\frac{1}{6}$ $\times$ 12 = \$ 87.50 Ans.

19. \$ 2.52 $\div$ 7 = \$ 0.36; \$ 0.36 $\times$ 11 = \$ 3.96; \$ 3.96 $\div$ 9 = \$ 0.44; \$ 0.44 $\times$ 4 = \$ 1.76 Ans.

20. \$ 80.00 $\div$ 3 = \$ 26.66$\frac{2}{3}$; \$ 26.66$\frac{2}{3}$ $\times$ 4 = \$ 106.66$\frac{2}{3}$; \$ 106.66$\frac{2}{3}$ $\div$ 8 = \$ 13.33$\frac{1}{3}$; \$ 13.33$\frac{1}{3}$ $\times$ 7 = \$ 93.33$\frac{1}{3}$ Ans.

21. \$ 631.89 $\div$ 9 = \$ 70.21; \$ 70.21 $\times$ 16 = \$ 1123.36; \$ 1123.36 $\div$ 14 = \$ 80.24; \$ 80.24 $\times$ 5 = \$ 401.20 Ans.

22. \$ 141.52 $\div$ 4 = \$ 35.38; \$ 35.38 $\times$ 5 = \$ 176.90; \$ 176.90 $\div$ 29 = \$ 6.10; \$ 6.10 $\times$ 5 = \$ 30.50 Ans.

23. \$ 1728 $\div$ 3 = \$ 576; \$ 576 $\times$ 8 = \$ 4608; $\frac{8}{8} - \frac{3}{8} = \frac{5}{8}$; $\frac{5}{8} \times \frac{4}{5} = \frac{1}{2}$; \$ 4608 $\times \frac{1}{2}$ = \$ 2304 Ans.
2

24. \$ 82.80 $\div$ 4 = \$ 20.70; \$ 20.70 $\times$ 7 = \$ 144.90; $\frac{7}{7} - \frac{4}{7} = \frac{3}{7}$; $\frac{3}{7} \times \frac{2}{3} = \frac{2}{7}$; \$ 144.90 $\div$ 7 = \$ 20.70; \$ 20.70 $\times$ 2 = \$ 41.40 Ans.

25. 26£. 12s. 6d. $\div$ 5 = 5£. 6s. 6d.; 5£. 6s. 6d. $\times$ 9 = 47£. 18s. 6d.; $\frac{9}{9} - \frac{5}{9} = \frac{4}{9}$; $\frac{4}{9} \times \frac{7}{8} = \frac{7}{18}$; 47£. 18s. 6d. $\div$ 18 = 2£. 13s. 3d.; 2£. 13s. 3d. $\times$ 7 = 18£. 12s. 9d. Ans.
2

27. $49.00 ÷ 3 = $16.33⅓; $16.33⅓ ÷ 11 = 1.48\frac{16}{33}$ 1.48\frac{16}{33}$ × 81 = 120.27\frac{3}{11}$ Ans.
28. $78.80 ÷ 11 = 7.16\frac{4}{11}$; 7.16\frac{4}{11}$ ÷ 9 = 0.79\frac{8}{99}$ 0.79\frac{8}{99}$ × 31 = 24.67\frac{47}{99}$ Ans.
29. 37£. 18s. 10d. ÷ 3 = 12£. 12s. 11⅓d.; 12£. 12s. 11⅓d. ÷ 8 = 1£. 11s. 7$\frac{5}{12}$d.; 1£. 11s. 7$\frac{5}{12}$d. × 43 = 67£. 19s. 6$\frac{11}{12}$d. Ans.
30. $40 ÷ 5 = $8.00; $8.00 ÷ 7 = 1.14\frac{2}{7}$; 1.14\frac{2}{7}$ × 137 = 156.57\frac{1}{7}$ Ans.
31. $360 ÷ 20 = $18; $18 ÷ 6 = $3; $3 × 263 = $789 Ans.
32. $8.75 ÷ 7 = $1.25; $1.25 ÷ 11 = 0.11\frac{4}{11}$; 0.11\frac{4}{11}$ × 205 = 23.29\frac{6}{11}$ Ans.
33. $19.80 ÷ 3 = $6.60; $6.60 ÷ 7 = 0.94\frac{2}{7}$; 0.94\frac{2}{7}$ × 81 = 76.37\frac{1}{7}$ Ans.
35. 3cwt. ÷ 151 = $\frac{3}{151}$; $\frac{3}{151} \times \frac{8}{1} = \frac{24}{151}$; $\frac{24}{151} \times \frac{7}{1} = \frac{168}{151}$ = 1$\frac{60}{151}$cwt. Ans.
36. $276.18 ÷ 24 = 11.50\frac{3}{4}$; 11.50\frac{3}{4}$ × 7 = 80.55\frac{1}{4}$; 80.55\frac{1}{4}$ × 75 = 6041.43\frac{3}{4}$ Ans.
37. $875.00 ÷ 81 = 10.80\frac{20}{81}$; 10.80\frac{20}{81}$ × 11 = 118.82\frac{58}{81}$; 118.82\frac{58}{81}$ × 75 = 8912.03\frac{18}{27}$ Ans.
38. $70 ÷ 35 = $2; $2 × 8 = $16; $16 × 86 = $1376 Ans.
39. $375.00 ÷ 111 = 3.37\frac{93}{111}$; 3.37\frac{93}{111}$ × 4 = 13.51\frac{38}{111}$; 13.51\frac{38}{111}$ × 69 = 932.43\frac{9}{37}$ Ans.
40. $80.50 ÷ 23 = $3.50; $3.50 × 5 = $17.50; $17.50 × 15 = $262.50 Ans.
41. $62.37 ÷ 81 = $0.77; $0.77 × 11 = $8.47; $8.47 × 19 = $160.93 Ans.
43. $668.50 ÷ 191 = $3.50; $3.50 × 11 = $38.50; $38.50 ÷ 5 = $7.70; $7.70 × 449 = $3457.30 Ans.
44. $1738 ÷ 79 = $22; $22 × 4 = $88; $88 ÷ 11 = $8; $8 × 411 = $3288 Ans.
45. 1128ft. ÷ 47 = 24; 24 × 4 = 96; 96 ÷ 8 = 12; 8 × 1435 = 11480 feet, Ans.

46. 116cwt. $\div$ 29 = 4; 4 $\times$ 8 = 32; 32 $\div$ 4 = 8; 8 $\times$ 47 = 376cwt. Ans.

47. 376 $\div$ 47 = 8; 8 $\times$ 4 = 32; 32 $\div$ 8 = 4; 4 $\times$ 29 = 116cwt. Ans.

48. \$ 8 $\div$ 10 = $\frac{4}{5}$; $\frac{4}{5} \times \frac{7}{1} = \frac{28}{5}$; $\frac{\overset{7}{\cancel{28}}}{5} \times \frac{1}{\cancel{4}} = \frac{7}{5}$; $\frac{7}{5} \times \frac{\overset{7}{\cancel{35}}}{1} =$ \$ 49 Ans.

49. \$ 414 $\div$ 207 = \$ 2; \$ 2 $\times$ 10 = \$ 20; \$ 20 $\div$ 5 = \$ 4; \$ 4 $\times$ 59 = \$ 236 Ans.

Miscellaneous Questions by Analysis.

1. (P. **179.**) \$ 896.50 $\div$ 11 = \$ 81.50; \$ 81.50 $\times$ 10 = \$ 815 Ans.

2. \$ $17\frac{3}{11} \div 3 =$ \$ $5\frac{25}{33}$; \$ $5\frac{25}{33} \times 37 =$ \$ $213.03\frac{1}{33}$ Ans.

3. \$ 3687 $\div$ 8 = \$ 460.87$\frac{1}{2}$; \$ 460.87$\frac{1}{2} \times 7 =$ \$ 3226.-12$\frac{1}{2}$ Ans.

4. $17\frac{7}{12} = \frac{211}{12}$; $187\frac{3}{8} = \frac{1499}{8}$; $\frac{1499}{8} \div \frac{211}{12} = \frac{1499}{\overset{2}{\cancel{8}}} \times \frac{\overset{3}{\cancel{12}}}{211}$ $= \frac{4497}{422}$; $\frac{4497}{422} \times \frac{5}{7} = \frac{22485}{2954} =$ \$ $7.61\frac{253}{1477}$ Ans.

5. \$ $13\frac{7}{8} = \frac{111}{8}$; $\frac{111}{8} \times \frac{11}{5} = \frac{1221}{40} =$ \$ $30.52\frac{1}{2}$ Ans.

6. \$ $37\frac{3}{11} = \frac{410}{11}$; $\frac{410}{11} \div 100 = \frac{41}{110}$; $\frac{41}{110} \times \frac{4}{7} = \frac{164}{770} =$ \$ $0.21\frac{23}{77}$ Ans.

7. \$ 0.12 $\times \frac{11}{4} = \frac{132}{4}$; $48\frac{7}{13} = \frac{631}{13}$; $\frac{\overset{33}{\cancel{132}}}{4} \times \frac{631}{13} = \frac{20823}{13}$ $=$ \$16.01$\frac{10}{13}$ Ans.

8. \$ $3\frac{2}{7} = \frac{23}{7}$; $6\frac{3}{5} = \frac{33}{5}$; $\frac{23}{7} \times \frac{9}{4} = \frac{207}{28}$; $\frac{207}{28} \times \frac{33}{5} = \frac{6831}{140}$ $=$ \$ $48\frac{111}{140}$ Ans.

9. \$ 236 $\div$ $11\frac{4}{5} = \frac{\overset{4}{\cancel{236}}}{1} \times \frac{5}{\cancel{59}} =$ \$ 20; \$ 20 $\times$ $20\frac{7}{10} =$ \$ 414 Ans.

10. $97\frac{1}{7} \div 3 = 32\frac{11}{21}$; $1073\frac{2}{7} \div 32\frac{11}{21} = \frac{\overset{11}{\cancel{7513}}}{7} \times \frac{3}{\cancel{21}} = 33$ bales. Ans.

11. $\$48\frac{111}{140} \div 6\frac{1}{5} = \frac{6831}{140} \div \frac{31}{5} = \frac{\overset{207}{\cancel{6831}}}{\underset{28}{\cancel{140}}} \times \frac{5}{\cancel{33}} = \frac{207}{28}$; $\frac{\overset{23}{\cancel{207}}}{\underset{7}{\cancel{28}}} \times \frac{4}{9} = \frac{23}{7} = \$3.28\frac{4}{7}$ Ans.

12. $34 \div 3\frac{3}{4} = \frac{34}{1} \times \frac{4}{11} = \frac{136}{11}$; $\frac{136}{11} \times 74\frac{1}{2} = \frac{\overset{51}{\cancel{102}}}{11} \times \frac{149}{2} = \frac{7599}{11} = \$6.90\frac{9}{11}$ Ans.

13. $\$63 \div 2\frac{5}{7} = 63 \div \frac{19}{7} = \frac{63}{1} \times \frac{7}{19} = \frac{441}{19}$; $\frac{\overset{49}{\cancel{441}}}{19} \times \frac{148}{9} = \frac{7252}{19} = \$381\frac{13}{19}$ Ans.

14. $\$17\frac{4}{11} \div (3 \times 3) = \$17\frac{4}{11} \div 9 = \$1\frac{92}{99}$; $\$1\frac{92}{99} \times 4 = \$7\frac{71}{99}$ Ans.

15. $\$31\frac{1}{7} = \frac{221}{7}$; $2\frac{5}{6} = \frac{17}{6}$; $\frac{221}{7} \div \frac{17}{6} = \frac{\overset{13}{\cancel{221}}}{7} \times \frac{6}{\cancel{17}} = \frac{78}{7}$;

$680\frac{4}{13} = \frac{8861}{13}$; $\frac{\overset{6}{\cancel{78}}}{7} \times \frac{8961}{\cancel{13}} = \frac{53766}{7} = \$7680\frac{6}{7}$ Ans.

16. $\$63 \div 6\frac{2}{3} = \frac{63}{1} \div \frac{20}{3} = \frac{63}{1} \times \frac{3}{20} = \frac{189}{20}$; $\frac{189}{\underset{10}{\cancel{20}}} \times \frac{\overset{9}{\cancel{18}}}{1} = \frac{1701}{10} = \$170.10$ Ans.

17. $\$243\frac{1}{11} = \frac{2674}{11}$; $\frac{96}{1} \div \frac{2674}{11} = \frac{\overset{48}{\cancel{96}}}{1} \times \frac{11}{\underset{1337}{\cancel{2674}}} = \frac{528}{1337}$; $\$1000 \times \frac{528}{1337} = 394\frac{1222}{1337}$ barrels, Ans.

18. $83\frac{9}{16} = \frac{1337}{16}$; $\$7888.30 \div \frac{1337}{16} = \frac{\overset{590}{\cancel{788880}}}{1} \times \frac{16}{\cancel{1337}} = \$94.40$; $\$94.40 \times 7 = \$660.80$ Ans.

19. 132£. 12s. = 2652s.; $7\frac{5}{9} = \frac{68}{9}$; $12\frac{7}{9} = \frac{115}{9}$; 2652s. $\div \frac{68}{9} = \frac{\overset{39}{\cancel{2652}}}{1} \times \frac{9}{\cancel{68}} = 351$s.; $\frac{\overset{39}{\cancel{351}}}{1} \times \frac{115}{9} = 4485$s. = 224£. 5s. Ans.

20. $17\frac{7}{8} = \frac{53}{3}$; $89\frac{1}{3} = \frac{268}{3}$; $\$ 25.44 \div \frac{53}{3} = \frac{\overset{48}{\cancel{2544}}}{1} \times \frac{3}{\cancel{53}} =$ $\$ 144$; $\frac{\overset{48}{\cancel{144}}}{1} \times \frac{268}{\cancel{3}} = \$ 128.64$ Ans.

21. $7\frac{7}{12} = \frac{91}{12}$; $19\frac{11}{12} = \frac{239}{12}$; $\$ 7.28 \div \frac{91}{12} = \frac{\overset{8}{\cancel{728}}}{1} \times \frac{12}{\cancel{91}} =$ $\$ 0.96$; $\$ 0.96 \times \frac{239}{12} = \$ 19.12$ Ans.

22. $49\frac{6}{7} = \frac{349}{7}$; $37\frac{5}{7} = \frac{264}{7}$; $\$ 4355.52 \div \frac{349}{7} = \frac{\overset{1248}{\cancel{435552}}}{1} \times$ $\frac{7}{\cancel{349}} = \$ 87.36$; $\frac{\overset{1248}{\cancel{8736}}}{1} \times \frac{264}{\cancel{7}} = \$ 3294.72$ Ans.

23. $\frac{1}{4} \times \frac{3}{5} = \frac{3}{20}$; $\$ 300{,}000 \div 3 = \$ 100{,}000$; $\$ 100{,}000 \times 20$ $= \$ 2{,}000{,}000$ Ans.

24. $7\frac{6}{13} = \frac{97}{13}$; $19\frac{3}{4} = \frac{79}{4}$; $\$ 135.80 \div \frac{97}{13} = \frac{\overset{140}{\cancel{13580}}}{1} \times \frac{13}{\cancel{97}} =$ $\$ 18.20$; $\frac{\overset{455}{\cancel{1820}}}{1} \times \frac{79}{\cancel{4}} = \$ 359.45$ Ans.

25. 6 cords 76ft. = 844ft.; $\frac{7}{7} - \frac{3}{7} = \frac{4}{7}$; $4\frac{4}{5} = \frac{24}{5}$; 844ft. $\times \frac{4}{7} = \frac{844}{1} \times \frac{4}{7} = \frac{3376}{7}$; $\frac{3376}{7} \times \frac{24}{5} = \frac{81024}{35} =$ $\$ 23.14\frac{34}{35}$ Ans.

26. 30rd. $\times$ 30rd. $= 900$; $18 + 82 = 100$; $900 - 100 = 800$; $\frac{800}{900} = \frac{8}{9}$ Ans.

27. 7T. 12cwt. 3qr. 18lb. — 3T. 18cwt. 1qr. 20lb. = 3T. 14cwt. 1qr. 23lb. = 7448lb.; 7448lb. $\times \frac{3}{5} = 4468\frac{4}{5}$lb.; $4468\frac{4}{5}$lb. $\times \$ 0.05\frac{3}{7} = \$ 242.59\frac{1}{5}$ Ans.

28. $\$ 68.50 \times 37 = \$ 2534.50$; $\$ 2534.50 \times \frac{3}{4} = \$ 1900.-$ $87\frac{1}{2}$ = value of coffee; $\$ 2534.50 - \$ 1900.87\frac{1}{2} =$ $\$ 633.62\frac{1}{2}$ Ans.

29. $\frac{4}{4} - \frac{3}{4} = \frac{1}{4}$; $\$ 7896 \times \frac{1}{4} = \$ 1974$; $\$ 1974 \times 2 =$ $\$ 3948$ Ans.

30. $\frac{13}{13} - \frac{4}{13} = \frac{9}{13}$; $\frac{9}{13} \times \frac{5}{13} = \frac{45}{169}$; $\frac{9}{13} - \frac{45}{169} = \frac{72}{169}$; $88 $\times \frac{72}{169} = \frac{8800}{1} \times \frac{72}{169} = \frac{633600}{169} = \$37.49\frac{19}{169}$ Ans.

31. $\frac{4}{4} - \frac{3}{4} = \frac{1}{4}$; $\frac{1}{\cancel{4}_{2}} \times \frac{\overset{1}{\cancel{2}}}{3} = \frac{1}{6}$; $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$; $\frac{1}{\cancel{12}_{4}} \times \frac{3}{4} = \frac{1}{16} =$ $750; $\frac{16}{16} = \$750 \times 16 = \$12{,}000$ Ans.

32. 1A. = 43560ft.; $100 \times 100 \times 20000$ft. 43560ft. $-$ 20000ft. 23560ft.; 23560ft. $\times 8 = \$1884.80$ Ans.

DECIMAL FRACTIONS.

Notation of Decimal Fractions.

(Art. **181**, p. **183**.)

1.	307.25	7.	75.9
2.	47.7	8.	2000.002
3.	18.05	9.	18.018
4.	29.003	10.	505.001006
5.	.0049	11.	300.0000042
6.	8.000008	12.	2500.000000037
			or 2500.000000000037

Addition of Decimals.

(Art. **183**, p. **184**.)

(2.)	(3.)	(4.)
171.61111	.16711	151.01
16.7101	1.766	611111.01
.00007	76111.1	16.5
71.0006	167.1	6.7
1.167895	.000007	46.1
260.489775	1476.1	.67896
	77756.233117	611331.99896

(5.)	(6.)	(7.)
56000.014	49.0105	3.0018
19.19	89.107	1005.023043
57.0048	.000127	87.107
23005.4	.0048	.0049
.000014	138.122427	47000.00309
79081.608814		48095.139833

Subtraction of Decimals.

(Art. **184**, p. **185.**)

(6.)	(7.)	(8.)	(9.)	(10.)
81.35	1.	100.	87.1	100.
11.678956	.876543	99.111176	5.6789	.001
69.671044	.123457	.888824	81.4211	99.999

(11.)	(12.)	(13.)	(14.)	(15.)
73.	365.	357000.	.875	.3125
.073	.0047	28.0004009	.4	.125
72.927	364.9953	356971.9995991	.475	.1875

(16.)	(17.)	(18.)	(19.)	(20.)
.95	3.7	8.125	9.375	.666
.44	1.8	2.6875	1.5	.041
.51	1.9	5.4375	7.875	.625

Multiplication of Decimals.

(Art. **185**, p. **187.**)

3.	.12649	6.	1137.
4.	18.58922	7.	2.20947
5.	.00000114	8.	.00046967
		9.	22.09

(10.)	(11.)	(12.)	(13.)
.087	107000.0015	.0097	.096
.000015	.0107	400.67	.00096
.000001305	7490000105	679	576
	1070000015	582	864
	1144.90001605	388	.00009216
		3.886499	

(14.)	(15.)	(16.)	(17.)
1000000.	100.	.101	1050.0007
.000001	.0014	.10101	.00305
1.000000	400	101	52500035
	100	101	31500021
	.14	101	3.202502135
		.01020201	

(18.)	(19.)	(20.)
2000000.	400.004	$ 1.125
.7	30.03	46.
1400000.0	1200012	6750
	1200012	4500
	12012.12012	$ 51.75

(21.)	(22.)	(23.)
17.125	$ .125	375025
18.875	18.	0.62
85625	1000	75050
119875	125	225150
137000	$ 2.250	$ 232.6550
137000		
17125		
$ 323.234375		

Division of Decimals.

3. (Art. 186, p. 189.)	.375	7.	.01728
4.	2.069	8.	9.784
5.	1930.51	9.	125.36
6.	.069255	10.	148.939+

(11.)	(12.)	(13.)
1.2)172.8(144.	.12)1728.00(14400.	.12).1728(1.44

(14.)	(15.)	(16.)
12)1.728(.144	1.2)17.28(14.4	.0012)1728.0000(1440000.

(17.)
12).001728(.000144

(18.)
1000)116.31(.11631

(19.)
9.7)147.828(15.24

(20.)
5.42801)75.16000(13.846+

(21.)
.328).678767(2.069+

Reduction of Decimals.

(Art. **187**, p. **190.**)

(2.)
4)3.00
.75

(3.)
8)7.000
.875

(4.)
16)7.0000
.4375

(5.)
17)4.000000
.235294+

(6.)
11)4.000000
.363636+

(7.)
12)5.000000
.416666+

(8.) $.875 = \frac{875}{1000} = \frac{7}{8}$ Ans.

(9.) $.4375 = \frac{4375}{10000} = \frac{7}{16}$ Ans.

(10.) $.\dot{7}\dot{2} = \frac{72}{99} = \frac{24}{33} = \frac{8}{11}$ Ans.

(11.) $.\dot{1}3\dot{5} = \frac{135}{999} = \frac{45}{333} = \frac{5}{37}$ Ans.

(12.) $.23562\dot{2} = \frac{23562\frac{2}{9}}{1000} = \frac{23327}{99000}$ Ans.

(13.) $.093\dot{3} = \frac{93\frac{3}{9}}{100} = \frac{84}{900} = \frac{7}{75}$ Ans.

(Art. **188**, p. **191.**)

(2.)
12 | 6.0
20 | 15.5
.775

(3.)
25 | 14.
4 | 2.56
20 | 5.64
.282

(4.)
25 | 21.00
4 | 3.84
.96

(5.)

40 | 8.0
8 | 6.200
.775

(6.)

144 | 72.0
272½ | 167.5
40 | 19.615243
4 | 3.490381
.872595+

(Art. 189, p. 192.)

(2.)

.628125
20
12.562500
12
6.750000
4
3.000000
Ans. 12s. 6¾d.

(3.)

.778125
20
15.562500
4
2.250000
25
6.250000
16
4.000000
Ans. 15cwt. 2qr. 6lb. 4oz.

(4.)

.75
5
3.75
4
3.00
Ans. 3qr. 3na.

(5.)

.965625
8
7.725000
40
29.000000
Ans. 7fur. 29rd.

(6.)

.94375
4
3.77500
40
31.00000
Ans. 3R. 31p.

(7.)

.185625
12
9.787500
20
15.750000
24
18.000000
Ans. 9oz. 15pwt. 18gr.

(8.)

.5555
12
6.6660
8
5.3280
3
.9840
20
19.6800
Ans. 6℥ 5℥ 0℈ 19$\frac{11}{25}$gr.

EXERCISES IN DECIMALS.

(1.)

25 | 14.
4 | 3.56

15.89
9.50

79450
14301

$ 150.95 50

(2.)

25 | 7.
4 | 1.28
20 | 18.32

17.916
53.80

1433280
53748
89580

$ 963.88 080

3. $16 \div 40 = .4$; $3 + .4 = 3.4$; $3.4 \div 4 = .85$; $37 + .85 = 37.85$; $37.85 \times 75.16 = \$ 2844.806$ Ans.
4. $2 \div 4 = .5$; $3 + .5 = 3.5$; $3.5 \div 4 = .875$; $15 + .875 = 15.875$; $15.875 \times 3.75 = \$ 59.53125$ Ans.
5. $15.375 \times 4.625 = \$ 71.109375$ Ans.
6. $36 \div 40 = .9$; $6 + .9 = 6.9$; $6.9 \div 8 = .8625$; $17 + .8625 = 17.8625$; $17.8625 \times 3765.60 = \$ 67263.03$ Ans.
7. $21 \div 63 = .333+$; $27 + .333+ = 27.333+$; $27.333+ \times \$ 15.375 = \$ 420.24\ 4875+$ Ans.
8. $9 \div 12 = .75$; $18 + .75 = 18.75$; $6 \div 12 = .5$; $4 + .5 = 4.5$; $3 \div 12 = .25$; $7 + .25 = 7.25$; $18.75 \times 4.5 \times 7.25 = 611.71875$ft.; $.71875 \times 1728 = 1242$in. Ans. 611ft. 1242in.
9. $6 \div 12 = .5$; $12 + .5 = 12.5$; $9 \div 12 = .75$; $2 + .75 = 2.75$; $12.5 \times 2.75 = 34.375$ft.; $.375 \times 144 = 54$in. Ans. 34ft. 54in.
10. $1 \div 2 = .5$; $3 + .5 = 3.5$; $3.5 \div 4 = .875$; $25 + .875 = 25.875$; $25.875 \times .375 = \$ 9.703125$ Ans.
11. $30 \div 40 = .75$; $3 + .75 = 3.75$; $3.75 \div 4 = .9375$; $144 + .9375 = 144.9375$; $144.9375 \times 97.625 = 14149.52\text{-}34375$ Ans.
12. $21 \div 25 = .84$; $.84 \div 4 = .21$; $18 + .21 = 18.21$; $18.21 \div 20 = .9105$; $3 + .9105 = 3.9105$; $3.9105 \times 9.375 = \$ 36.6609375$; $\$ 36.6609375 - \$ 20.25 = \$ 16.4109\ 375$ Ans.

13. $5.50 ÷ 7 = $.78$\frac{4}{7}$; $.78$\frac{4}{7}$ × 8 = 6.28\frac{4}{7}$; 6.28\frac{4}{7}$ × 7.75 = 48.7142\frac{6}{7}$ Ans.

14. 12\frac{3}{8}$ = 12.625; 4\frac{3}{4}$ = 4.75; 12.625 ÷ 4.75 = 2.657894+; 2.657894+ × 17.375 = $46.18,09+ Ans.

15. $\frac{1}{2} - \frac{1}{4} = \frac{2}{4}$; $\frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4}$; $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$; $17500 × $\frac{1}{2}$ = $87500; $87500 + $500 = $18000; $9000 + $9200 + $18000 = $36200; $36200 − $18000 = $1200 Ans.

PERCENTAGE.

2.	(ART. **191**, p. **195.**) $6.50	6.	$490
3.	$39.45	7.	$15.12
4.	$51.389	8.	26.415 yards
5.	57.375 tons.	9.	$877.50

10. 5000 × 1.25 = $6250; $5000 × .25 = 1250; 5000 − 1250 = 3750; 3750 × 2 = $7500; $7500 − $6250 = $1250 Ans.

11. $8000 × .19 = $1520; $8000 − $1520 = $6480; $6480 × .37 = $2397.60; $6480.00 − $2397.60 = $4082.40; $4082.40 − $2000 = $2082.40 Ans.

(12.)

$1\frac{3}{4} = 1.75$

$1.75 \times .95 = 1.6625$

$10 \div 1.6625 = 6\frac{2}{133} = \frac{800}{133}$

$\frac{800}{133} \times \frac{100}{95} = \frac{80000}{12635}$

12635)80000(6yd.
75810
4190
4
12635)16760(1qr.
12635
4125
4
12635)16500($1\frac{1773}{12527}$na
12635
3865

Ans. 6yd. 1qr. $1\frac{1773}{12527}$na.

13. $10,000 × .15 = $1500; $10,000 − $1500 = $8500 Ans.

SIMPLE INTEREST.

(ART. **193**, p. **198.**)

2. $ 0.08 1
3. $ 0.10 7
4. $ 0.22 3⅓
5. $ 0.12 8⅓
6. $ 0.42 2½
7. $ 0.01 9⅔
8. $ 0.25 0⅝
9. $ 0.02 0½

(ART. **194**, p. **199.**)

2. $ 11.82
3. $ 311.04
4. $ 8.28
5. $ 155.52
6. $ 1.68 7
7. $ 17.72 2
8. $ 8.25 8
9. $ 90.83 5
10. $ 1110.23 4
11. $ 88.39 9
12. $ 122.71 5
13. $ 1.24 8
14. $ 0.20 5
15. $ 50.01 6
16. $ 0.03 1
17. $ 55.60 7
18. $ 149.77 6
19 $ 7.20 5
20. $ 1.05 7

(ART. **195** p. **201.**)

1. $ 10.08
2. $ 97.18
3. $ 231.29 9
4. $78.41 4
5. $ 446.92 9
6. $ 0.84 9
7. $ 430.36
8. $ 137.92 2
9. $ 14.15 1
10. $ 33.97 9
11. $ 1645.02
12. $ 13.91
13. $ 209.82
14. $ 1183.18
15. $ 21.03 7
16. $ 388.94

(ART. **196**, p. **202.**)

2. $ 745.50
3. $ 207.27
4. $ 19.71 3
5. $ 61.75 4
6. $ 1.86 8
7. $ 2163.19 9
8. $ 274.77 5
9. $ 131.99
10. $ 253.11 9
11. $ 95.02 8
12. $ 1904.12 1

(2.) (ART. **197**, p. **203.**)

26£. 10s. = 26.50£.

Interest of 1£. = .14

10600
2650
6)3.7100
6183⅓
3.0916⅔
(Carried up.)

(Brought up.)
3.0916⅔
20
1.8333⅓
12
10.0000
3£. 1s. 10d. Ans.

(3.)

42£. 18s. = 42.90£.

Interest of 1£. = .109⅙

38610
4290
715
4.68325
20
13.66500
12
7.98
4
3.92
4£. 13s. 7¾d. Ans.

(4.)

94£. 12s. 6d. = 94.625£.

Interest of 1£. = .271⅙

94625
662375
189250
15770
⅔ = ⅓)25.659145
8.553048
34.212193
20
4.243860
12
2.92632
4
3.70528
34£. 4s. 2¾d. Ans.

MISCELLANEOUS EXERCISES IN INTEREST.

(PAGE **204.**)

NOTE. — When the required interest is more or less than 6 per cent., we may first find the interest at 6 per cent. by the foregoing Rules, then divide this interest by 6, and the quotient will be the interest of the required sum at 1 per cent. Then, if we multiply the 1 per cent. by the required per cent., we obtain the answer. Or the pupil, if he please, can perform the following questions by Article 200.

(1.)

y.	mo.	d.
1852	6	9
1850	8	25
1	9	14

$172.50
.107 1/3
120750
17250
5750
$18.51 500

(2.)

y.	mo.	d.
1851	4	5
1848	11	10
2	4	25

$169.75
.144 1/6
67900
67900
16975
2829
$24.47 229

(3.)

y.	mo.	d.
1851	8	1
1847	6	29
4	1	2

$17.18
.245 1/3
8590
6872
3436
572
$4.21 482

(4.)

y.	mo.	d.
1851	11	11
1849	3	7
2	8	4

$67.07
.160 2/3
402420
6707
4471
$10.77 591

(5.)

y.	mo.	d.
1851	11	19
1849	0	7
2	11	12

$117.75
.177
82425
82425
11775
$20.84 175

(6.)

y.	mo.	d.
1853	0	11
1849	9	9
3	3	2

$847.15
.195 1/3
423575
762435
84715
28238
$165.47 663

(7.)

y.	mo.	d.
1852	1	11
1851	2	1
	11	10

$7.18
.056 2/3
4308
3590
478
$.40 686

(8.)

y.	mo.	d.
1855	10	25
1852	4	29
3	5	26

$976.18
.209 1/3
878562
195236
32539
$204.34 701

(9.)

y.	mo.	d.
1852	2	9
1849	6	25
2	7	14

$144
.157 1/3
1008
720
14448
22.656
144.
$166.65 6

(10.)

y.	mo.	d.
1852	0	1
1850	0	19
1	11	12

$375.83
.117
263081
37583
37583
43.97 211
375.83
419.80 211
79.33 918
$499.14 129

y.	mo.	d.
1852	0	1
1851	3	23
	8	8

$76.19
.041⅓
7619
30476
2539
3.14 918
76.19
$79.33 918

(11.)

y.	mo.	d.
1851	5	11
1850	5	5
1	0	6

$68.19
.061
6819
40914
6)4.15 959
.69 326
$4.85 285

(12.)

y.	mo.	d.
1852	11	30
1849	1	17
3	10	13

$79.15
.232⅙
15830
23745
15830
1319
6)18.37 599
3.06 266
7½
21.43 862
1.53 133
22.96 995
79.15
$102.11 995

(13.)

y.	mo.	d.
1851	11	9
1850	5	19
1	5	20

$89.96
.088⅓
71968
71968
2998
6)7.94 646
1.32 441
8¼
10.59 528
.33 110
10.92 638
89.96
$100.88 638

(14.)

y.	mo.	d.
1851	6	4
1849	5	5
2	0	29

$325.00
.124⅝
130000
65000
32500
27000
6)40.57 000
6.76 166
7¼
47.33 162
1.69 041
49.02 203
325.
$374.02 203

(15.)

y.	mo.	d.
1852	9	9
1849	11	29
2	9	10

$1728
.166⅔
10368
10368
1728
1152
6)288.000
48.000
9
432.000
1728.
$2160.000

(16.)

y.	mo.	d.
1852	6	4
1851	0	29
1	5	5

$976.18
.085⅚
488090
780944
81348
83.78 878
2
$167.57 756

(17.)

y.	mo.	d.
1853	8	25
1851	4	7
2	4	18

$175.08
.143
52524
70032
17508
6)25.03 644
4.17 274
29.20 918
175.08
$204.28 9

(18.)

y.	mo.	d.
1854	8	9
1853	11	11
	8	28

$160
.044⅔
640
640
106
6)7.14 6
1.19 1
8.33 7
160.
$168.33 7

Ed

d.
9
29
10

28
66⅔
68
8

52
00
00
9
00

00

(16.)

y.	m.	d.
1852	6	4
1851	0	29
1	5	5

$976.18
.085⅚
488090
780944
81348
83.78 878
2
$167.57 756

d.
25
7
18

.08
143
524
32
08
644
274
918

(18.)

y.	m.	d.
1854	8	9
1853	11	11
	8	28

$160

Partial Payments.

(Art. 198, p. 205.)

(2.)

Principal,		$ 987.75
Interest for 9 months, 2 days,		44.77
Amount,		$ 1032.52
First payment,	$ 300.00	
Interest for 7 months, 12 days,	11.10	
Second payment,	400.00	
Interest for 6 months, 8 days,	12.53	
Third payment,	150.00	
Interest for 2 months, 18 days,	1.95	
		$ 875.58
Balance remains due Dec. 13, 1852,		$ 156.94

y. mo. d.	y. mo. d.	y. mo. d.	y. mo. d.
1852 11 13	1852 11 13	1852 11 13	1852 11 13
1852 0 11	1852 4 1	1852 5 5	1852 8 25
11 2	7 12	6 8	2 18
2 0			
9 2			
$ 987.75	$ 300	$ 400	$ 150
.045⅓	.037	.031⅓	.013
493875	2100	400	450
395100	900	1200	150
. 32925	$ 11.10 0	133	$ 1.95 0
$ 44.77 800		$ 12.53 3	

(3.)

Principal,		$ 800.00
Interest for 10 months, 27 days,		43.60
Amount,		$ 843.60
First payment,	$ 144.00	
Interest for 9 months, 21 days,	6.98	
Second payment,	90.00	
Interest for 7 months,	3.15	
Amounts carried forward,	$ 244.13	$ 843.60

Amounts brought forward,	$ 244.13	$ 843.60
Third payment, ...	400.00	
Interest for 5 months, ...	10.00	
Fourth payment, ...	100.00	
Interest for 2 months, 27 days, . .	1.45	
		$ 755.58
Remains due June 1, 1853, ...		$ 88.02

y.	mo.	d.
1853	5	1
1852	6	4
	10	27

$ 800
.054½
3200
4000
400
$ 43.60 0

y.	mo.	d.
1853	5	1
1852	7	10
	9	21

$ 144
.048½
1152
576
72
$ 6.98 4

y.	mo.	d.
1853	5	1
1852	10	1
	7	0

$ 90
.035
450
270
$ 3.15 0

y.	mo.	d.
1853	5	1
1853	0	1
	5	0

$ 400
.025
2000
800
$ 10.00,0

y.	mo.	da.
1853	5	1
1853	2	4
	2	27

$ 100
.014½
400
100
50
$ 1.45 0

(ART. **200**, p. **208**.)

(2.)

Principal, carrying interest from June 5, 1848, .	$ 1666.00
Interest from June 5, 1848, to January 1, 1851, 30 months, 26 days, ...	257.11
Amount carried forward,	$ 1923.11

Amount brought forward,		$ 1923.11
First payment, July 4, 1849, a sum less than the interest,	$ 100.00	
Second payment, Jan. 1, 1850, a sum less than the interest,	10.00	
Third payment, July 4, 1850, a sum less than the interest,	15.00	
Fourth payment, Jan. 1, 1851, a sum larger than the interest,	500.00	
		625.00
		1298.11
Interest from Jan. 1, 1851, to Feb. 7, 1852, 13 months, 6 days,		85.67
Amount,		1383.78
Fifth payment, Feb, 7, 1852,		656.00
		727.78
Interest from Feb. 7, 1852, to Jan. 1, 1853, 10 months, 24 days,		39.30
Remains due Jan. 1, 1853,		$ 767.08

(3.)

Principal on interest from Oct. 23, 1850,	$ 960.00
Interest from Oct. 23, 1850, to Sept. 25, 1851, 11 months, 2 days,	61.97
Amount,	1021.97
First payment, Sept. 25, 1851,	140.00
New principal, carrying interest from Sept. 25, 1851,	881.97
Interest from Sept. 25, 1851, to July 7, 1852, 9 months, 12 days,	48.36
Amount,	930.33
Second payment, July 7, 1852,	80.00
New principal, carrying interest from July 7, 1852,	850.33
Interest from July 7, 1852, to Dec. 9, 1852, 5 months, 2 days,	25.13
Amount carried forward,	$ 875.46

Amount brought forward,	$ 875.46
Third payment, Dec. 9, 1852,	70.00
New principal, carrying interest from Dec. 9, 1852,	805.46
Interest from Dec. 9, 1852, to Nov. 8, 1853, 10 months, 29 days,	51.52
Amount,	856.98
Fourth payment, Nov. 8, 1852,	100.00
New principal, carrying interest from Nov. 8, 1853,	756.98
Interest from Nov. 8, 1853, to Oct. 23, 1854, 11 months, 15 days,	50.78
Balance due Oct. 23, 1854,	$ 807.76

(4.)

Principal on interest from March 1, 1849,	$ 1000.00
Interest from March 1, 1849, to March 1, 1850, 12 months,	70.00
Amount,	1070.00
First payment, March 1, 1850,	100.00
Principal, carrying interest from March 1, 1850,	970.00
Interest from March 1, 1850, to Sept. 25, 1851, 18 months, 24 days,	106.37
Amount,	1076.37
Second payment, Sept. 25, 1851,	200.00
Principal, carrying interest from Sept. 25, 1851,	876.37
Interest from Sept. 25, 1851, to Oct. 9, 1852, 12 months, 14 days,	63.73
Amount	940.10
Third payment, Oct. 9, 1852,	150.00
Principal, carrying interest from Oct. 9, 1852,	790.10
Interest from Oct. 9, 1852, to Oct. 9, 1853, 12 months,	55.30
Amount carried forward,	$ 845.40

	Amount brought forward,	$ 845.40
Fourth payment, July 4, 1853, a sum less than the interest,	$ 20.00	
Fifth payment, Oct. 9, 1853, a sum greater than the interest,	300.00	
		320.00
Principal, carrying interest from Oct. 9, 1853,		525.40
Interest from Oct. 9, 1853, to Dec. 1, 1854, 13 months, 22 days,		42.09
Balance due Dec. 1, 1854,		$ 567.49

(ART. **201**, p. **209**.)

(1.)

Principal,	$ 500.00
Interest from July 1, 1854, to Sept. 1, 1855, 14 months,	35.00
Amount,	535.00
First payment, Sept. 1, 1855,	100.00
Balance for new principal,	435.00
Interest from Sept. 1, 1855, to Sept. 1, 1856, 1 year,	26.10
Amount,	461.10
Amount of 2d payment, from April 1, 1856, to Sept. 1, 1856, 5 months,	147.60
Balance for new principal,	313.50
Interest from Sept. 1, 1856, to Sept. 1, 1857, 1 year,	18.81
Amount,	332.31
Amount of 3d payment, from Jan. 1, 1857, to Sept. 1, 1857, 8 months,	94.12
Balance for new principal,	238.19
Interest from Sept. 1, 1857, to Dec. 1, 1858, 15 months,	17.86
Amount,	256.05
Fourth payment,	168.05
Balance for new principal,	88.00
Interest from Dec. 1, 1858, to Oct. 1, 1859, 10 months,	4.40
Amount due Oct. 1, 1859,	$ 92.40

Problems in Interest.

2. (Art. **204**, p. **211.**) $ 250 × .0125 = $ 3.125; $ 28.125 ÷ 3.125 = 9 per cent. Ans.
3. $ 72 × .0175 = $ 1.26; $ 8.82 ÷ 1.26 = 7 per cent. Ans.
4. $ 500 × .025 = $ 12.50; $ 550 — $ 500 = $ 50; 50 ÷ 12.50 = 4 per cent. Ans.
5. $ 700 × .015 = $ 10.50; $ 63.00 ÷ $10.50 = 6 per cent. Ans.
6. $ 922 × .01$\frac{1}{8}$ = $ 10.75$\frac{3}{8}$; $ 53.78$\frac{1}{8}$ ÷ $ 10.75$\frac{3}{8}$ = 5 per cent. Ans.

2. (Art. **205.**) $ 140 × .06 = $ 8.40; 42.00 ÷ 8.40 = 5 years, Ans.
3. $ 165 × .06 = $ 9.90; 14.85 ÷ 9.90 = 1 year, 6 months, Ans.
4. $ 98 × .08 = $ 7.84; 25.48 ÷ 7.84 = 3 years, 3 months, Ans.
5. $ 727.60 — $ 680 = $ 47.60; $ 680 × .04 = $ 27.20; 47.60 ÷ 27.20 = 1 year, 9 month, Ans.

2. (Art. **206**, p. **212.**) $ 1.00 × .255 = $ 0.255; $ 24.225 ÷ .255 = $ 95 Ans.
3. $ 1.00 × .28 = $ 0.28; $ 5.11 ÷ .28 = $ 18.25 Ans.
4. $ 1.00 × .15 = $ 0.15; $ 42 ÷ .15 = $ 280 Ans.

COMPOUND INTEREST.

2. (Art. **208**, p. **214.**) $ 761.75 × 1.06 × 1.06 × 1.06 × 1.06 = $ 961.691; $ 961.691 — $ 761.75 = $ 199.941 Ans.
3. $ 67.25 × 1.06 × 1.06 × 1.06 = $ 80.095 Ans.
4. $ 78.69 × 1.07 × 1.07 × 1.07 × 1.07 × 1.07 = $ 110.364 Ans.
5. $ 128 × 1.06 × 1.06 × 1.06 × 1.028 = $ 156.71,7 Ans.
6. $ 76.18 × 1.06 × 1.06 × 1.041$\frac{1}{2}$ = $ 89.14,7; $ 89.147 — $ 76.18 = $ 12.96,7 Ans.

2. (ART. **209**, p. **215**.) $1.315931, amount of $1 for 7 years at 4 per cent.; $884 × 1.315931 = $1163.28,3; $1163.-283 − $884 = $279.283 Ans.
3. $1.551328, amount of $1 for 9 years at 5 per cent.; $721 × 1.551328 = $1118.507; $1118.507 − $721 = $397.507 Ans.
4. $1.425760, amount of $1 for 12 years at 3 per cent.; $960 × 1.425760 = $1368.7296; $1.015, amount of $1 for 6 months at 3 per cent.; $1368.7296 × 1.015 = $1389.26 Ans.
5. $3.869685, amount of $1 for 20 years at 7 per cent.; $25.50 × 3.869685 = $98.67696; $1.014, amount of $1 for 2 months and 12 days at 7 per cent.; $98.67696 × 1.014 = $100.058 Ans.
6. $12 × 1.005 × 1.005 × 1.005 × 1.005 × 1.005 × 1.005 = $12.364+ Ans.
7. $100 × $1.000\frac{1}{6}$ × $1.000\frac{1}{6}$ × $1.000\frac{1}{6}$ × $1.000\frac{1}{6}$ × $1.000\frac{1}{6}$ × $1.000\frac{1}{6}$ = $100.10004 Ans.

DISCOUNT.

2. (ART. **213**, p. **217**.) $1.06, amount of $1 for 1 year; $152.64 ÷ 1.06 = $144 Ans.
3. $1.24 amount of $1 for 4 years; $477.71 ÷ 1.24 = $385.25 Ans.
4. $1.20 amount of $1 for 3 years, 4 months; $172.86 ÷ 1.20 = $144.05; $172.86 − $144.05 = $28.81 Ans.
5. $1.218 amount of $1 for 3 years, 7 months, 18 days; $800 ÷ 1.218 = $656.814+; $800 − $656.814 = $143.-186 Ans.

	y.	mo.	d.
6.	1854	0	1
	1852	9	4
	1	2	27

$1.0745, amount of $1.00 for 1 year, 2 months, 27 days; $375.75 ÷ 1.0745 = $349.697 Ans.

	y.	mo.	d.	
7.	1853	3	5	$1.015\frac{3}{4}$, amount of $1.00 for 3 months, 4 days; $125.75 ÷ $1.015\frac{3}{4}$ = $123.81+ Ans.
	1853	0	1	
		3	4	

COMMISSION, BROKERAGE, AND STOCKS.

(ART. **215**, p. **219**.)

(2.)	(3.)	(4.)	(5.)
$ 5678	$ 7896	$ 1728	$ 15.50
.03	.02	$.01\frac{1}{2}$	97
$ 170.34	$ 157.92	1728	10850
		864	13950
		$ 25.92	1503.50
			$.02\frac{1}{2}$
			30.0700
			7.5175
			$37.5875

	(6.)		(7.)	(8.)
$ 6.50		$ 2.75	$ 2500	$ 46256
500		88	$.00\frac{1}{2}$	$.00\frac{1}{8}$
3250.00		2200	$ 12.50	$ 57.82
242.00		2200		
593.60		$ 242.00		
4085.60		$ 10.60	(9.)	
$.03\frac{3}{4}$		56	2)205.00	
1225680		6360	$ 102.50	
306420		530		
$ 153.2100		$ 593.60		

2. (ART. **216**, p. **220**.) $ 2000 ÷ 1.015 = $ 1970.443, sum invested; $ 2000 − $ 1970.443 = $ 29.557, commission, Ans.

3. $ 5256 ÷ 1.03 = $ 5102.912; $ 5256 − $ 5102.912 = $ 153.088 Ans.

4. $ 8865.94 ÷ 1.04 = $ 3717.25, sum expended; $ 3865.94 — $ 3717.25 = $ 148.69, commission, Ans.
5. $ 10000 ÷ 1.03,25 = $ 9685.23+, value of flour; $ 10000 — $ 9685.23+ = $ 314.76+, commission, Ans.

(ART. **217**, p. **220**.)

2. $ 100 × 10 = $ 1000; $1000 × .15 = $ 150; $ 1000 + $ 150 = $1150 Ans.
3. $ 100 × 75 = $ 7500; $ 7500 × .25 = $ 1875; 7500 + $ 1875 = $ 9375.
4. $ 8979 × .12 = $ 1077.48; $ 8979 + $ 1077.48 = $ 10056.48 Ans.
5. $ 1789 × .09 = $ 161.01; $ 1789 — $ 161.01 = $ 1627.99 Ans.
6. $ 100 × 5 = $ 500; $ 500 × .12 = $ 60 Ans.
7. $ 100 × 20 = $ 2000 × .12½ = $ 250; $ 2000 — $ 250 = $ 1750 Ans.
8. $ 100 × 15 = $ 1500 × .08¼ = $ 123.75; $ 1500 + $ 123.75 = $ 1623.75 Ans.
9. $ 175 × 87 = $ 15225; 15225 × 31½ = $ 4795.875 Ans.

BANK DISCOUNT.

(ART. **220**, p. **223**.)

(2.)	(3.)	(4.)	(5.)
$ 478	$ 780	$ 1728	$ 1000
.010½	.005½	.15½	.20½
4780	3900	8640	20000
239	390	1728	500
$ 5.01 9	$ 4.29 0	864	$ 20.50 0
		$ 26.78 4	

$ 1000
20.50
Ans. $ 979.50

(6.)

$875.35
.038
700280
262605
6)33.26 330
5.54 386
$38.80 716

$875.35 0
38.80 7
$836.54 2 Ans.

(7.)

$596.24
.042
119248
238496
25.04 208
8
6)200.33 664
$33.38 944

$596.24 0
33.38 9
$562.85 1 Ans.

(8.)

$1350.50
.080½
10804000
67525
108.71 525
5
6)543.57 625
Ans. $90.59 604

(ART. **221**, p. **224**.)

2. $1.0000 — .0205 = .9795; $300 ÷ .9795 = $306.278 Ans.
3. $1.0000 — .0305 = .9695; $4572.40 ÷ .9695 = $4716.-245 Ans.
4. $1.0000 — .0255 = .9745; $1000 ÷ .9745 = $1026.-167 Ans.
5. $1.000000 — .050625 = .949375; $483.56 ÷ .949375 = $509.345 Ans.

INSURANCE.

(ART. **223**, p. **225**.)

(2.)

$868
.12
$104.16

(3.)

$1728
.15
8640
1728
$259.20

(4.)

$3500
.01¾
3500
2625
$61.25

(5.)	(6.)
$ 35000	$ 75000
.03¾	.02½
105000	150000
26250	37500
$ 1312.50	$ 1875.00 premium.
$ 35000.00	$ 75000
1312.50	1875
Ans. $ 33687.50	$ 73125 loss

CUSTOM-HOUSE BUSINESS.

2. (Art. 225, p. 226.) $ 3200 × .20 = $ 640 Ans.
3. 2231 × .04 = $ 89.24; $ 89.24 × .30 = $ 26.77 2, duty, Ans.
4. 1691 × .05 = $ 84.55; $ 84.55 × .20 = $ 16.91, duty, Ans.
5. 150 × 10 = 1500; 1500 — 50 = 1450; 1450 × .25 = $ 362.50; $ 362.50 × .20 = $ 72.50 Ans.
6. 450 × .15 = 67½lb.; 450 — 67½ = 382½lb.; 382½lb. × 13 = 4972½lb.; 4972½lb. × .08 = $ 397.80; $ 397.80 × .30 = $ 119.34 Ans.
7. 1376 × $ 4.84 = $ 6659.84; $ 6659.84 × .30 = $ 1997.-95 2 Ans.
8. $ 2340 × .80 = $ 1872 Ans.

ASSESSMENT OF TAXES.

(Art. 227, p. 228.)

(2.)

$ 1.25 × 600 = $ 750, amount assessed on the polls.
$ 3600 — $ 750 = $ 2850, amount to be assessed on the property.
$ 560,000 + $ 152,500 = $ 712,500, amount of taxable property.
$ 2850 ÷ 712,500 = $ .004, tax on $ 1.00.

$ 4100 × .004 = $ 16.40, B's tax on real estate.
$ 1800 × .004 = $ 7.20, B's tax on personal property.
$ 1.25 × 4 = $ 5.00, B's tax on 4 polls.
$ 16.40 + $ 7.20 + $ 5.00 = $ 28.60, B's tax.

(3.)

$ 15,800 × .004 = $ 63.20 Ans.

(4.)

$ 40,000 × .004 = $ 160, tax on D's real estate.
$ 23,600 × .004 = $ 94.40, tax on D's personal property.
$ 1.25 × 3 = $ 3.75, D's tax for 3 polls.
$ 160 + $ 94.40 + $ 3.75 = $ 258.15, amount of D's tax, Ans.

(ART. 228, p. 229.)

(1.)

$ 1.50 × 500 = $ 750.00, amount assessed on the polls.
$ 3900 — $ 750 = $ 3150, amount to be assessed on the property.
$ 840,000 + $ 210,000 = $ 1,050,000, am't of taxable property.
$ 3150 ÷ 1,050,000 = $ .003, assessment on $ 1.00.

(3.)

$ 3175	Tax on	$ 9000 =	$ 27.00
$ 6535	"	700 =	2.10
$ 9710	"	10 =	.03
	"	6 polls =	9.00
		Ans.	$ 38.13

(4.)

Tax on	$ 7000 =	$ 21.00	
"	900 =	2.70	
"	80 =	.24	
	Ans.	$ 23.94	

(5.)

Tax on	$ 4000 =	$ 12.00		
"	700 =	2.10		
"	90 =	.27	$ 9280	
"	2 polls =	3.00	$ 3600	
	Ans.	$ 17.37	$ 12880	

(6.)

Tax on	$ 12000 =	$ 36.00
"	800 =	2.40
"	80 =	.24
"	4 polls =	6.00
	Ans.	$ 44.64

EQUATION OF PAYMENTS.

(2.) (ART. 230, p. 231.) (3.)

$250 × 4 = 1000
$350 × 8 = 2800
$400 × 12 = 4800
$1000 1000)8600(8mo.
8000
600
30
1000)18000(18da.
18000

$390 × 3 = 1170
$312 × 6 = 1872
$260 × 8 = 2080
$598 × 10 = 5980
$1560 1560)11102(7 91/780 mo
10920
182
1560 = 91/780

Ans. 8mo. 18d.

(4.)

$1000
$1000 × 12 = 12000
$2000 × 24 = 48000
$4000 4000)60000(15mo.

(5.)

$1250
$1250 × 6 = 7500
$1000 × 9 = 9000
$1500 × 12 = 18000
$5000 5000)34500(6mo.
30000
4500
30
5000)135000(27da.
10000
35000
35000

(ART. 231, p. 233.)

(2.)

Due April 15, $96.46
" 23, 49.63 × 8 = 39704
May 1, 175.80 × 16 = 281280
" 11, 78.39 × 26 = 203814
Sept. 19, 114.92 × 157 = 1804244
$515.20 51520)2329042(45+da.
206080
268242
257600
10642

Ans. May 30, or in 45da.

(3.)

Due May	7, 1854,	$ 375.60			
Aug.	18, "	687.25	× 103 =	7078675	
Dec.	7, "	568.50	× 214 =	12165900	
March	1, 1855,	100.00	× 298 =	2980000	
"	25, "	300.00	× 322 =	9660000	
Aug.	5, "	675.75	× 455 =	30746625	
		$ 2707.10	270710)	62631200	(231+da.
				541420	
				848920	
				812130	
				367900	
				270710	
Ans. Dec. 24, or in 231da.				97190	

(4.)

Due April	1, 1857,	$ 436.50			
"	11, "	129.50	× 10 =	129500	
July	15, "	132.00	× 105 =	1386000	
Sept.	1, "	405.00	× 153 =	6196500	
"	5, "	72.00	× 157 =	1130400	
Oct.	25, "	91.00	× 207 =	1883700	
Mar.	1, 1858,	120.00	× 334 =	4008000	
		$ 1386.00	138600)	14734100	(106+da.
				138600	
				874150	
				831600	
Ans. July 16, or in 106da.				42550	

(5.)

Due July 1, 1854, $300 =
Nov. 1, " 500 × 4 = 2000
March 1, 1855, 200 × 8 = 1600
Oct. 1, " 800 × 15 = 12000
April 1, 1857, 400 × 33 = 13200
July 1, " 900 × 36 = 32400
Aug. 1, " 100 × 37 = 3700
$3200 3200)64900(20mo. 8da.
6400
900
30
3200(27000(8+da.
25600
Ans. March 9, 1856. 1400

(ART. 232, p. 234.)

(2.) March 11, 1855 + 4 months =
July 11, 1855.

Dr. $1850.	1855.			
	April 7,	$400 × 95 =	38000	Cr
	May 15,	270 × 57 =	15390	
	June 20,	350 × 21 =	7350	
		$1020	$60740	

$1850 − $1020 = $830; 60740 ÷ 830 = 73 days.
July 11 + 73 = September 22, 1855, Ans.

(3.) June 12, 1855 + 8 months =
Feb. 12, 1856

Dr. $1200.				
	Sept. 1,	$400 × 164 =	65600	Cr.
	Nov. 1,	200 × 103 =	20600	
	Dec. 1,	100 × 73 =	7300	
		$700	$93500	

$1200 − $700 = 500; 93500 ÷ 500 = 187 days.
Feb. 12 + 187 = August 17, 1856, Ans.

(4.) September 25, 1855 + 6 months = March 25, 1856.

Dr.				Cr.
$ 2838.	Sept. 25, 1855,	$ 1000 × 182 =	182000	
	Nov. 1,	800 × 145 =	116000	
	Dec. 21,	600 × 95 =	57000	
		$ 2400	$ 355000	

$ 2838 — $ 2400 = $ 438; 355000 ÷ 438 = 811 days.
March 25, 1856 + 811 days = June 14, 1858, Ans.

(5.) March 20, 1855 + 6 months = Sept. 20, 1855.

Dr.				Cr.
$ 2000.	March 20, 1855,	$ 500 × 184 =	92000	
	May 10,	350 × 133 =	46550	
	June 7,	400 × 105 =	4200	
		$ 1250	$ 180550	

$ 2000 — $ 1250 = $ 750; 180550 ÷ 750 = 241 days.
September 20, 1855 + 241 days = May 18, 1856, Ans.

COMPOUND EQUATION OF PAYMENTS.

(ART. 233, p. 236.)

(2.)

Debits.			Credits.		
Feb. 16,	$ 375.80		Mar. 20,	$ 300	
Apr. 8,	432.18 × 51 =	2204118	July 4,	200.00 × 106 =	2120000
May 17,	320.15 × 90 =	2881350	Dec. 17,	371.50 × 272 =	10094800
July 13,	158.12 × 147 =	2324264	Mar. 25, 1855,	85.20 × 370 =	3152400
	1286 25	7409832		956.70	15367200(160+
					95670 =161 da.
					580020
					574020
					60000

7409832 ÷ 128625 = 58 days. Feb. 16 + 58 = April 15; April 15 + 6 m. = Oct. 15, 1854.

128625 — 95670 = 32955.

March 20 + 161 days = August 28.

From Aug. 28 to Oct. 15 = 48 days; $956.70 × 48 = 4592160; 4592160 ÷ 32955 = 139 days. Oct. 15, 1854 + 139 days = March 3, 1855, Ans.

(3.)

Dr. *Edward Doton in account with Daniel Stetson.* *Cr.*

1855			1855		
May 1,	To Merchandise	$500	Mar. 7,	By Pleasure Boat	$400
May 15,	" Timber	400	April 2,	" Merchandise	200
June 14,	" Horse	300	May 6,	" "	300
July 24,	" Labor	100	June 13,	" Carriage	120
		$1300			$1020

OPERATION.

Debits.			Credits.		
May 1,	$500		March 7,	$400	
May 15,	400 × 14 =	5600	April 2,	200 × 26 =	5200
June 14,	300 × 44 =	13200	May 6,	300 × 60 =	18000
July 24,	100 × 84 =	8400	June 13,	120 × 98 =	11760
	$1300	27200		$1020	$34960

27200 ÷ 1300 = 21 days. May 1 + 21 = May 22; May 22 + 6 months = Nov. 22, 1855.

34960 ÷ 1020 = 34 days; March 7 + 34 = April 10; April 10 + 6 mo. = Oct. 10, 1855. Nov. 22 — Oct. 10 = 43 days.

$1300 — $1020 = $280; $1020 × 43 = 43860. $43860 ÷ 280 = 157 days; Nov. 22, 1855 + 157 days = April 27, 1856.

SIMPLE PROPORTION.

5. (ART. **245**, p. **242.**) 63gal. : 9gal. : : $14.49 : $2.07 Ans.
6. 19A. : 97A. : : $337.25 : $1721.75 Ans.
7. 11da. : 47da. : : 319 miles : 1363 miles, Ans.
8. 15bar. : 79bar. : : $120 : $632 Ans.
9. 3 days : 12 days : : 9 horses : 36 horses, Ans.
10. 7gal. : 27gal. : : $5.88 : $22.68 Ans.
11. 9lb. : 147lb. : : $10.80 : $176.40 Ans.
12. 9 tons : 27 tons : : $85.95 : $257.85 Ans.
13. 15 tons : 765 tons : : $105 : $5355 Ans.
14. 16hhd. : 176hhd. : : $320 : $3520 Ans.
15. 15cwt. 3qr. 17lb. = 1592lb. : 76cwt. 2qr. 19lb. = 7669lb : : $124.67 : $600.56+ Ans.

16. 1m. : 32m. : : 2m. 8sec. = 128sec. : 4096sec. = 1h. 8m. 16sec. Ans.
17. 1h. = 3600sec. : 9h. 45m. 19sec. = 35119sec. : : 3m. 7fur 18rd. = 1258rd. : 12272+rd. = 38m. 2fur. 32+rd. Ans
18. 21 — 15 = 6rd. : 21rd. : : 96rd. : 336rd. Ans.
19. 4 + 5 = 9 men : 5 men : : 12h. : : $6\frac{2}{3}$h. Ans.
20. 10 — 3 = 7 men : 10 men : : 63da. : 90da. Ans.
21. \$ 7.50 : \$ 5.00 : : 5oz. : $3\frac{1}{3}$oz. Ans.
22. 13h. : 14h. : : 10da. : $10\frac{10}{13}$da. Ans.
23. 40lb. : 79lb. : : 29lb. : $57\frac{11}{40}$lb. Ans.
26. $11\frac{1}{5}$yd. : 100yd. : : $4\frac{7}{11}$yd. = $\frac{52}{5}$: $\frac{100}{1}$: : $\frac{5}{11}$ = $\frac{5}{52} \times \frac{100}{1} \times \frac{5}{11} = \frac{2500}{572} = 39\frac{188}{572}$yd. Ans.
27. 18da. : 36da. : : 144 men : 108 men; 144 — 108 = 36 men, Ans.
28. d. d. w. w.
6 : 1 : : 1 : $\frac{1}{6}$, the part James will do in one day.
8 : 1 : : 1 : $\frac{1}{8}$, the part John will do in one day.
$\frac{1}{6} + \frac{1}{8} = \frac{7}{24}$, the part James and John will do in one day.
$\frac{7}{24}$w. : 1w. : : 1da. : $3\frac{3}{7}$da. Ans.
29. 10da. : 1da. : : 1w. : $\frac{1}{10}$w. = part Atwood would do in a day.
7da. : 1da. : : 1w. : $\frac{1}{7}$w. = part Jerry and his father would do in a day.
6d. : 1da. : : 1w. : $\frac{1}{6}$w. = part Jacob and his father would do in a day.
$\frac{1}{7} - \frac{1}{10} = \frac{3}{70}$ = part Jerry would do in a day.
$\frac{1}{6} - \frac{1}{10} = \frac{1}{15}$ = part Jacob would do in a day.
$\frac{3}{70} + \frac{1}{15} = \frac{23}{210}$ = part Jerry and Jacob would do in a day.
$\frac{23}{210}$w. : 1w. : : 1da. : $9\frac{3}{23}$ days, Ans.
31. \$ 5.00 × 40 = \$ 200.00, price given for the cloth;
1.00 : 1.15 : : \$ 200.00 : \$ 230.00 Ans.
32. 1.00 : 0.70 : : \$ 175.00 : \$ 122.50 Ans.
33. \$ 6.00 — \$ 5.00 = \$ 1.00;
\$ 5.00 : \$ 1.00 : : 100 : 20 per cent. Ans.
34. \$ 15.00 — \$ 12.00 = \$ 3.00;
\$ 15.00 : \$ 3.00 : : 100 : 20 per cent. Ans.

35. $0.25 : $27.50 : : 1gal. : 110 gallons, Ans.

36. $15.75 : $1728 :: 1A. : 109A. 2R. 34$\frac{2}{7}$p. Ans.

37. If the first cook will empty the cistern in 2 hours, in 1 hour $\frac{1}{2}$ of it will be emptied. The second cock will empty $\frac{1}{3}$ of it in 1 hour. The third cock will empty $\frac{1}{4}$ of it in 1 hour. Therefore, in 1 hour, $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$ of the cistern will be emptied. And if $\frac{13}{12}$ of the cistern be emptied in 1 hour, $\frac{1}{12}$, or the whole cistern, will be emptied in $55\frac{5}{13}$ minutes; $\frac{13}{12} : \frac{1}{12}$: : 60m. : $55\frac{5}{13}$m. Ans.

Compound Proportion.

(Art. 247, p. 246.)

(3.)

$$\left.\begin{array}{l}\$\ 800 : \$\ 100 \\ \$\ 6 : \$\ 32\end{array}\right\} : : \text{12mo.} : \text{8mo. Ans.} \quad \frac{\cancel{100} \times \overset{4}{\cancel{32}} \times \overset{2}{\cancel{12}}}{\underset{\$}{\cancel{800}} \times \cancel{6}} = \text{8mo.}$$

(4.)

$$\left.\begin{array}{l}\$\ 6 : \$\ 32 \\ \text{8mo.} : \text{12mo.}\end{array}\right\} : : \$100 : \$800 \text{ Ans.} \quad \frac{\overset{4}{\cancel{32}} \times \overset{2}{\cancel{12}} \times 100}{\cancel{6} \times \$} = \$\ 800$$

(5.)

$$\left.\begin{array}{l}\$\ 800 : \$\ 100 \\ \text{8mo.} : \text{12mo.}\end{array}\right\} : : \$\ 32 : \$\ 6, \text{ that is, 6 per cent. Ans.}$$

$$\frac{\overset{6}{\cancel{100}} \times 12 \times \overset{4}{\cancel{32}}}{\$\cancel{00} \times \$} = \$\ 6.$$

(6.)

$$\left.\begin{array}{l}\text{20 men} : \text{15 men} \\ \text{10 hours} : \text{15 hours}\end{array}\right\} : : \text{60 days} : 67\tfrac{1}{2} \text{ days, Ans.}$$

$$\frac{15 \times \overset{3}{\cancel{15}} \times \overset{3}{\cancel{60}}}{\cancel{20} \times \underset{2}{\cancel{10}}} = \frac{135}{2} = 67\tfrac{1}{2} \text{ days.}$$

(7.)

351bu. : 1404bu. } : : 939men : 5634 men, Ans.
2w. : 3w. }

$$\frac{\overset{2}{\cancel{1404}} \times 3 \times 939}{\underset{1}{\cancel{351}} \times \cancel{2}} = 5634 \text{ men.}$$

(8.)

8 men : 12 men } : : $ 64 : $ 384 Ans.
13 weeks : 52 weeks }

$$\frac{12 \times \overset{4}{\cancel{52}} \times \overset{8}{\cancel{64}}}{\cancel{8} \times \cancel{13}} = \$\ 384$$

(9)

8 horses : 32 horses } : : 42 bushels : 336 bushels, Ans.
24 days : 48 days }

$$\frac{\overset{4}{\cancel{32}} \times \overset{2}{\cancel{48}} \times 42}{\cancel{8} \times \cancel{24}} = 336 \text{ bushels.}$$

(10.)

24 men : 6 men
16 hours : 9 hours
20 feet : 200 feet } : : 16 days : 90 days, Ans.
6 feet : 16 feet
4 feet : 6 feet

$$\frac{\overset{10}{\cancel{6}} \times 9 \times \cancel{200} \times \cancel{16} \times \cancel{6} \times \overset{4}{\cancel{16}}}{\underset{4}{\cancel{24}} \times \cancel{16} \times \cancel{20} \times \cancel{6} \times \cancel{4}} = 90 \text{ days.}$$

(11.)

15 days : 20 days } : : 117 miles : 208 miles, Ans.
9 hours : 12 hours }

$$\frac{\overset{4}{\cancel{20}} \times \overset{4}{\cancel{12}} \times \overset{13}{\cancel{117}}}{\underset{3}{\cancel{15}} \times \cancel{9}} = 208 \text{ miles.}$$

(12.)

$$\left.\begin{array}{rcl} 30 \text{ men} & : & 12 \text{ men} \\ 30 \text{ feet} & : & 300 \text{ feet} \\ 6 \text{ feet} & : & 8 \text{ feet} \\ 3 \text{ feet} & : & 6 \text{ feet} \\ 8 \text{ hours} & : & 12 \text{ hours} \end{array}\right\} :: 15 \text{ days} : 240 \text{ days, Ans.}$$

$$\frac{\overset{4}{\cancel{12}} \times \overset{10}{\cancel{300}} \times 8 \times \cancel{6} \times \overset{\overset{2}{\cancel{4}}}{\cancel{12}} \times 15}{\cancel{30} \times \underset{3}{\cancel{30}} \times \cancel{6} \times \cancel{3} \times \underset{2}{\cancel{8}}} = 240 \text{ days.}$$

(13.)

$$\left.\begin{array}{rcl} 575 \text{ lb.} & : & 765 \text{ lb.} \\ 150 \text{ miles} & : & 32 \text{ miles} \end{array}\right\} :: \$\,24.58 : \$\,6.97+ \text{ Ans.}$$

$$\frac{\overset{51}{\cancel{765}} \times \overset{16}{\cancel{32}} \times 24.58}{575 \times \underset{\underset{5}{\cancel{10}}}{\cancel{150}}} = \frac{2005728}{2875} = \$\,6.97, \text{ Ans}$$

(14.)

$$\left.\begin{array}{rcl} \$\,1800 & : & \$\,600 \\ \$\,9 & : & \$\,9 \end{array}\right\} :: 6 \text{ months} : 2 \text{ months, Ans.}$$

$$\frac{\cancel{600} \times \cancel{9} \times \overset{2}{\cancel{6}}}{\underset{3}{\cancel{1800}} \times \cancel{9}} = 2 \text{ months.}$$

(15.)

$$\left.\begin{array}{rcl} 20 \text{ cows} & : & 28 \text{ cows} \\ 8 \text{ weeks} & : & 12 \text{ weeks} \end{array}\right\} :: 3 \text{ tons} : 6\tfrac{3}{10} \text{ tons, Ans}$$

$$\frac{\overset{7}{\cancel{28}} \times \overset{3}{\cancel{12}} \times 3}{\underset{5}{\cancel{20}} \times \underset{2}{\cancel{8}}} = \frac{63}{10} = 6\tfrac{3}{10} \text{ tons.}$$

(16.)

$$\left.\begin{array}{rcl} 12\tfrac{5}{11} \text{ men} & : & 5 \text{ men} \\ 30 \text{ acres} & : & 54 \text{ acres} \end{array}\right\} :: 10 \text{ days} : 7\tfrac{31}{137} \text{ days, Ans.}$$

$$\frac{5 \times \overset{18}{\cancel{54}} \times \cancel{10}}{\frac{137}{11} \times \underset{3}{\cancel{30}}} = \frac{90}{\frac{137}{11}} = \frac{90}{1} \times \frac{11}{137} = \frac{990}{137} = 7\tfrac{31}{137} \text{ days.}$$

(17.)

$$\left.\begin{array}{l} 18 \text{ men} : 2 \text{ men} \\ 12\tfrac{3}{4} \text{ rods} : 247\tfrac{2}{13} \text{ rods} \end{array}\right\} :: 6\tfrac{1}{2} \text{ days} : 14 \text{ days, Ans.}$$

$$\frac{2 \times \dfrac{\overset{\overset{7}{\cancel{63}}}{\cancel{3213}}}{\cancel{13}} \times \dfrac{\cancel{13}}{2}}{\underset{2}{\cancel{18}} \times \dfrac{\cancel{51}}{\underset{2}{\cancel{4}}}} = 14 \text{ days.}$$

(18.)

$$\left.\begin{array}{l} 24 \text{ men} : 248 \text{ men} \\ 9 \text{ hours} : 11 \text{ hours} \\ 7 \text{ hard.} : 4 \text{ hard.} \\ 232\tfrac{1}{2} \text{ feet} : 337\tfrac{1}{2} \text{ feet} \\ 3\tfrac{2}{3} \text{ feet} : 5\tfrac{3}{5} \text{ feet} \\ 2\tfrac{1}{3} \text{ feet} : 3\tfrac{1}{2} \text{ feet} \end{array}\right\} :: 5\tfrac{1}{2} \text{ days} : 132 \text{ days, Ans.}$$

$$\frac{\overset{\cancel{31}}{\cancel{248}} \times \cancel{11} \times \cancel{4} \times \dfrac{\overset{\overset{\overset{3}{\cancel{55}}}{\cancel{135}}}{\cancel{675}}}{\cancel{2}} \times \dfrac{\overset{4}{\cancel{28}}}{\cancel{5}} \times \dfrac{\cancel{7}}{\cancel{2}} \times \dfrac{11}{\cancel{2}}}{\underset{\cancel{4}}{\cancel{24}} \times \underset{\cancel{3}}{\cancel{9}} \times \cancel{7} \times \dfrac{\cancel{465}}{\cancel{2}} \times \dfrac{\cancel{11}}{\cancel{3}} \times \dfrac{\cancel{7}}{\cancel{3}}} = 132 \text{ days.}$$

PROFIT AND LOSS.

3. (ART. **249**, p. **249**.) \$ 5.40 × 40 = \$ 216, price paid; 40 × $\frac{3}{4}$ = 30; \$ 6.00 × 30 = \$180; 40 × $\frac{1}{4}$ = 10; 7 × 10 = \$ 70; \$ 180 + \$ 70 = \$ 250, price sold at; \$ 250 − \$ 216 = \$ 34; \$ 216 : \$ 34 : : 100 : 15$\frac{20}{27}$ per cent., Ans.

4. \$ 5 × 50 = \$ 250, price paid; \$ 5.98 ÷ 1.04 = \$ 5.75, present worth of \$ 5.98, due 8 months hence; \$ 5.75 ×

50 = $287.50, price sold at; $287.50 — $2.50 = $37.50; $2.50 : $37.50 :: 100 : 15 per cent. Ans.

5. 100 × 0.30 = $30, price paid; 100 — 30 = 70; 70 × 0.40 = $28, price sold at; $30 — $28 = $2; $30 : $2 :: 100 : $6\frac{2}{3}$ per cent. Ans.

6. 3000 × $1.12\frac{1}{2}$ = $3375, price paid; 3000 × 0.05 = $150, cost of transportation; $3375 + $150 = $3525, whole cost; 3000 × $1.37\frac{1}{2}$ = $4125, price sold at; $4125 — $3525 = $600; $3525 : $4125 :: 100 : $17\frac{1}{7}$ per cent. Ans.

7. $7\frac{3}{11}$rd. = $\frac{80}{11}$rd.; $\frac{80}{11} \times \frac{80}{11} = \frac{6400}{121}$rd., contents of the lot; $\frac{6400}{121} \times 5 = \frac{32000}{121}$, price paid; $\frac{1600}{\cancel{6400}} \times \frac{9}{\cancel{1089}} =$ 14400ft.; 14400 × 0.05 = $720 = $\frac{87120}{121}$; $\frac{87120}{121}$ — $\frac{32000}{121}$ = $\frac{55120}{121}$; $\frac{32000}{121} : \frac{55120}{121}$ :: 100 : $172\frac{1}{4}$ per cent. Ans.

3. (Art. **250**, p. **250**.) 120 × 0.30 = $36.00, price paid; 1.00 : .90 :: $36.00 : $32.40 Ans.

4. 8cwt. 3qr. 5lb. = 880lb.; 1.00 : 1.20 :: $88 : $105.60; $105.60 ÷ 880 = $0.12 per pound, Ans.

5. 1.00 : 1.12 :: $1728 : $1935.36; $1935.36 × 1.04 = $2012.77+, worth of $1935.36, 8 months hence, Ans.

6. 1.00 : 1.10 :: $4.00 : $4.40, price sold at; 32gal. — 8gal. = 24gal.; $4.40 ÷ 24 = 0.18\frac{1}{3}$, price per gallon, Ans.

7. $90 ÷ 1.03 = $87.37+, present worth of $90, due 6 months hence; 1.00 : 1.20 :: $87.37+ : $104.84+, Ans.

8. $11.50 × 7 = $80.50; 1.00 : .85 :: $80.50 : $68.42+, Ans.

3. (Art. **251**, p. **251**.) 1.00 — .625 = .37$\frac{1}{2}$; .37$\frac{1}{2}$: 1.00 :: $80 : $213.33\frac{1}{3}$, Ans.

4. 1.00 + .20 = 1.20; 1.20 : 1.00 :: $7.20 : $6.00 per cord, Ans.

5. 1.00 + .18 = 1.18; 1.18 : 1.00 :: $1600.00 : 1355.93+, Ans.

6. $8 × 17 = $136; $136 × .0155 = $2.10,8, discount

of $ 136 for 3 months; $ 136 — $ 2.10,8 = $ 133.89+, present worth of $ 136, due 3 months hence; 1.00 — .10 = .90; .90 : 1.00 :: 133.89+ : $ 148.76+, Ans.

2. (Art. **252**, p. **252**.) 1.00 + .12 = 1.12; $ 0.28 : $ 0.24 :: 1.12 : .96; 1.00 — .96 = .04 = 4 per cent. loss, Ans.
3. 1.00 — .25 = .75; $37.50 : $ 75 :: .75 : 1.50; 1.50 — 1.00 = .50 = 50 per cent. gain, Ans.
4. $ 1728 ÷ 1.045 = $ 1653.58+, present worth of $ 1728, due 9 months hence; $ 1653.58+ : $ 2000 :: 1.10 : 1.33+; 1.33+ — 1.00 = .33+ = 33+ per cent. gain, Ans.

Miscellaneous Exercises.

1. (p. **253**.) $ 84.00 — $ 75.60 = $ 8.40; $ 84.00 : $ 8.40 :: 1.00 : .10 = 10 per cent. loss, Ans.
2. 1.00 — .10 = .90; $ 75.60 : $ 97.44 :: .90 : 1.16; 1.16 — 1.00 = .16 = 16 per cent. gain, Ans.
3. 1.00 + .16 = 1.16; $ 97.44 : $ 75.60 :: 1.16 : .90; 1.00 — .90 = .10 = 10 per cent. loss, Ans. 1.16 : 1.00 :: $ 97.44 : $ 84, real value of the horse; $ 84 — $ 75.60 = $ 8.40, actual loss, Ans.
4. $5 ÷ $ 1.045 = $ 4.78+, present worth of 5, due 9 months hence; 1.00 + .12 = 1.12; 1.00 : 1.12 :: $ 4.78+ : $ 5.35+, Ans.
5. 1.00 + .10 = 1.10; 1.00 : 1.10 :: $ 40 : $ 44, price sold at; 120gal. — 20gal. = 100gal.; $ 44.00 ÷ 100 = $ 0.44 per gallon, Ans.
6. $ 5 : $ 7.50 :: 1.00 : 1.50; 1.50 — 1.00 = .50 = 50 per cent., Jones' gain; $ 0.10 : $ 0.14 :: 1.00 : 1.40; 1.40 — 1.00 = .40 = 40 per cent., Crosby's gain; 50 — 40 = 10 per cent., Jones' gain more than Crosby's, Ans.
7. $ 0.30 × 40 = $ 12.00; 30 cents on the dollar = .30 of the sum to be paid; $ 12.00 × .30 = $ 3.60, price received for 40gal.; 160gal. — 40gal. = 120gal.; $ 0.35 × 120 = $ 42.00, price received for 120gal.; $ 42.00 + $ 3.60 = $ 45.60, price received for 160gal.; 1.00 + .10 = 1.10; 1.10 : 1.00 :: 45.60 : $ 41.45+, Ans.

8. 1.00 − .10 = .90; .90 : 1.00 :: $ 75.60 : $ 84.00, real value of the horse; 1.00 + .16 = 1.16; 1.00 : 1.16 :: $ 84 : $ 97.44, received for the horse; $ 97.44 − $ 75.60 = $ 21.84; $ 7560 : $ 21.84 :: 1.00 : $.28\frac{8}{9} = 28\frac{8}{9}$ per cent. gained, Ans.

9. $1\frac{3}{4}$yd. = 1.75; 5 per cent. = .05; 100 − .05 = .95; 1.75yd. × .95 = 1.6625yd., width after shrinking; 70yd. × .95 = 66.5yd., length after shrinking; 66.5yd. × 1.6625 = 110.55+ square yards after shrinking; $ 4.50 × 70 = $ 315.00, price paid; 1.00 + .12 = 1.12; 1.00 : 1.12 :: $ 315.00 : $ 352.80, price sold at; $ 352.80 ÷ 110.55+ = $ 3.19+, price per sq. yd. Ans

PARTNERSHIP, OR COMPANY BUSINESS.

(ART. **254**, p. **255**.)

(2.)

A's stock, $ 6000 — $\frac{6000}{20000} = \frac{3}{10}$, A's fractional part.
B's stock, $ 9000 — $\frac{9000}{20000} = \frac{9}{20}$, B's fractional part.
C's stock, $ 5000 — $\frac{5000}{20000} = \frac{1}{4}$, C's fractional part.
$ 20000

$ 840	$ 840	$ 840
3	9	1
10)2520	20)7560	4)840
$ 252, A's gain.	$ 378, B's gain.	$ 210, C's gain.

(3.)

Parker, $ 8750 — $\frac{8750}{19360} = \frac{875}{1936}$, Parker's part.
Dole, $ 3610 — $\frac{3610}{19360} = \frac{361}{1936}$, Dole's part.
Gage, $ 7000 — $\frac{7000}{19360} = \frac{700}{1936}$, Gage's part.
$ 19360

$ 6875 − $ 375 = $ 6500

$\frac{\$\ 6500 \times 875}{1936} = \$\ 2937.75\frac{100}{121}$ = Parker's dividend.

$\frac{\$\ 6500 \times 361}{1936} = \$\ 1212.03\frac{62}{121}$ = Dole's dividend.

$\frac{\$\ 6500 \times 700}{1936} = \$\ 2350.20\frac{80}{121}$ = Gage's dividend.

(4.)

A's debt $ 500 $\frac{500}{2000} = \frac{1}{4}$, A's fractional part.
B's debt $ 386 $\frac{386}{2000} = \frac{193}{1000}$, B's fractional part.
C's debt $ 988 $\frac{988}{2000} = \frac{247}{500}$, C's fractional part.
D's debt $ 126 $\frac{126}{2000} = \frac{63}{1000}$, D's fractional part.
$ 2000

$\frac{\$\ 100 \times 1}{4} = \$\ 25.00$, A's part.
$\frac{\$\ 100 \times 193}{1000} = \$\ 19.30$, B's part.
$\frac{\$\ 100 \times 247}{500} = \$\ 49.40$, C's part.
$\frac{\$\ 100 \times 63}{1000} = \$\ 6.30$, D's part.

(5.)

The whole gain is $ 90; but C's gain is $ 30; A and B's gain, therefore, is $ 90 — $ 30 = $ 60; A's stock being $ 700, his share of the gain will be $\frac{700}{1000} = \frac{7}{10}$ of $ 60 = $ 42. B's stock being $ 300, his share of the gain will be $\frac{300}{1000} = \frac{3}{10}$ of $ 60 = $ 18. As the stock of each person in the firm bears the same proportion to his gain as the other, and as A's gain is $ 42, and his stock $ 700, therefore $ 42 A's gain : $ 700 A's stock :: $ 30 C's gain : $ 500 C's stock. Then $ 500 ÷ 100 = $ 5.00, value of C's flour per barrel.

STATEMENT.

$ 1000 : $ 700 :: $ 60 : $ 42, A's gain,
$ 1000 : $ 300 :: $ 60 : $ 18, B's gain, } Ans.
$ 42 : $ 30 :: $ 700 : $ 500, C's stock.
$ 500 ÷ 100 = $ 5.00, value of C's flour per barrel, Ans.

(ART. **255**, p. **256.**)

(2.)

$ 700 × 5 = 3500 $\frac{3500}{13300} = \frac{35}{133}$, A's fraction.
$ 800 × 6 = 4800 $\frac{4800}{13300} = \frac{48}{133}$, B's fraction.
$ 500 × 10 = 5000 $\frac{5000}{13300} = \frac{50}{133}$, C's fraction.
$ 13300

$\frac{\$399\times35}{133} = \$105$, A's gain. $\frac{\$399\times48}{133} = \$144$, B's gain.

$\frac{\$399\times50}{133} = \$150$, C's gain.

(3.)

Johnson's stock, $\$1000\times6 = 6000$
500
$\$1500\times6 = 9000$
$\$15000$

$\frac{15000}{43100} = \frac{150}{431}$, Johnson.

Hyde's stock, $\$800\times4 = 3200$
400
$\$1200\times6 = 7200$
500
$\$700\times2 = 1400$
$\$11800$

$\frac{11800}{43100} = \frac{118}{431}$, Hyde.

Tyler's stock, $\$1200\times7 = 8400$
300
$\$1500\times3 = 4500$
200
$\$1700\times2 = 3400$
$\$16300$

$\frac{16300}{43100} = \frac{163}{431}$, Tyler.

$\$15000$
11800
16300
$\$43100$

$\frac{\$1000\times150}{431} = \$348.02\frac{338}{431}$, Johnson's gain.

$\frac{\$1000\times118}{431} = \$273.78\frac{332}{431}$, Hyde's gain.

$\frac{\$1000\times163}{431} = \$378.19\frac{141}{431}$, Tyler's gain.

(4.)

The stock in trade is a horse and chaise to ride to Newburyport and back; the whole distance being 30 miles. The expense for the horse and chaise may be considered the "loss;" and the

proportional part which each rode, the "time." Now, by the rule, each man is to bear his share of the loss (expense) in proportion as he has the use of the stock in trade (horse and chaise). Morse had the use of the whole stock in trade for the first 4 and last 4 miles, for which he must pay $\frac{8}{30} = \frac{4}{15}$ of $3.00 = $0.80. For the remaining part of the distance, 22 miles, the expense was $\frac{22}{30} = \frac{11}{15}$ of $3.00 = $2.20. Of this sum, Jones and Morse will pay equal parts = $2.20 ÷ 2 = $1.10. Morse will therefore pay $0.80 + $1.10 = $1.90, and Jones $1.10.

$\frac{4}{15} + \frac{11}{15} \times \frac{1}{2} = \frac{19}{30}$, Morse's product.

$\frac{11}{15} \times \frac{1}{2} = \frac{11}{30}$, Jones' product.

$\frac{30}{30}$, sum of the products.

$\frac{30}{30} : \frac{19}{30} :: \$3.00$

19

2700

300

30)5700($1.90 = Morse's share of the expense.

30

270

270

0

$\frac{30}{30} : \frac{11}{30} :: \$3.00$

11

30)3300($1.10 = Jones' share of the expense.

30

30

30

0

(5.)

As Jones' capital was invested 12 months and Cotton's but 9 months, Cotton's capital must be $\frac{12}{9}$ of Jones' capital.

9 months : 12 months : : $1000 : 1333.33\frac{1}{3}$ Ans.

10

(6.)

$\$96 \div 8 = \$12$, S's gain in 1 mo. $\frac{12}{47}$ = S's share of stock.
$\$90 \div 6 = \$15$, C's gain in 1 mo. $\frac{15}{47}$ = C's share.
$\$80 \div 4 = \$20$, D's gain in 1 mo. $\frac{20}{47}$ = D's share.
$\$47$ whole gain.

$\$4700 \times \frac{12}{47} = \$1200$, S's stock,
$\$4700 \times \frac{15}{47} = \$1500$, C's stock,
$\$4700 \times \frac{20}{47} = \$2000$, D's stock, } Ans.

(7.)

$\$300 \times 7 = \$2100$ $\frac{2100}{8500} = \frac{21}{85}$, A's part.
$\$500 \times 8 = \$4000$ $\frac{4000}{8500} = \frac{8}{17}$, B's part.
$\$200 \times 12 = \$2400$ $\frac{2400}{8500} = \frac{24}{85}$, C's part.
$\$8500$

$\$85 \times \frac{21}{85} = \$21$, A's gain,
$\$85 \times \frac{8}{17} = \$40$, B's gain,
$\$85 \times \frac{24}{85} = \$24$, C's gain, } Ans.

(8.)

$\$10 \div 5 = \$2$, A's gain in 1 mo. $\frac{2}{5}$ = A's part of stock.
$\$12 \div 4 = \$3$, B's gain in 1 mo. $\frac{3}{5}$ = B's part.
$\$5$

$\$500 \times \frac{2}{5} = \$200$, A's stock,
$\$500 \times \frac{3}{5} = \$300$, B's stock, } Ans.

(9.)

$\$3000 \times 6 = \$18000$ $\$6000 \times 8 = \$48000$
$\$2000$ $\$3000$
$\$5000 \times 6 = \$30000$ $\$3000 \times 4 = \$12000$
$\$48000$, A. $\$60000$, B.

$\$48000$ $\frac{48000}{108000} = \frac{4}{9}$, A's share.
60000 $\frac{60000}{108000} = \frac{5}{9}$, B's share.
$\$108000$

$\$1080 \times \frac{4}{9} = \$480$, A's gain,
$\$1080 \times \frac{5}{9} = \$600$, B's gain, } Ans.

(10.)

$5 \times 4 = 20$ $\quad \frac{20}{150} = \frac{2}{15}$, A.
$6 \times 8 = 48$ $\quad \frac{48}{150} = \frac{8}{25}$, B.
$8 \times 5 = 40$ $\quad \frac{40}{150} = \frac{4}{15}$, C.
$3 \times 14 = 42$ $\quad \frac{42}{150} = \frac{7}{25}$, D.
150

$\$50 \times \frac{2}{15} = \$\ 6.66\frac{2}{3}$, A's share,
$\$50 \times \frac{8}{25} = \$\ 16.00$, B's share,
$\$50 \times \frac{4}{15} = \$\ 13.33\frac{1}{3}$, C's share,
$\$50 \times \frac{7}{25} = \$\ 14.00$, D's share, } Ans.

(11.)

$30 \times 50 = 1500$ $\quad \frac{1500}{5910} = \frac{50}{197}$, A.
$50 \times 36 = 1800$ $\quad \frac{1800}{5910} = \frac{60}{197}$, B.
$58 \times 45 = 2610$ $\quad \frac{2610}{5910} = \frac{87}{197}$, C.
5910

$\$7500 - \$112.50 = \$7387.50.$

$\$7387.50 \times \frac{50}{197} = \$\ 1875$, A receives,
$\$7387.50 \times \frac{60}{197} = \$\ 2250$, B receives,
$\$7387.50 \times \frac{87}{197} = \$\ 3262.50 + \$\ 112.50 = \$\ 3375$, C [receives, } Ans.

REDUCTION OF CURRENCIES.

2. (ART. **258**, p. **260**.) 144£. 7s. 6d. = 144.375£.; $144.375 \div \frac{3}{10} = \$\ 481.25$ Ans.
3. 74£. 1s. 6d. = 74.075£.; $74.075 \div \frac{2}{5} = \$185.18\frac{3}{4}$ Ans.
4. $129 \div \frac{3}{8} = \$344$ Ans.
5. $84 \div \frac{7}{30} = \$360$ Ans.
6. 144£. 4s. = 144.20£.; $144.20 \div \frac{1}{4} = 576.80$ Ans.
7. 257£. 8s. 6d. = 257.425£.; $257.425 \div \frac{25}{121} = \$1245.937$ Ans.

2. (ART. **259**, p. **261**.) $481.25 \times \frac{3}{10} = 144.375$£. = 144£. 7s. 6d. Ans.
3. $185.18\frac{3}{4} \times \frac{2}{5} = 74.075$£. = 74£. 1s. 6d. Ans.

4. 344 × $\frac{3}{8}$ = 129£. Ans.
5. 360 × $\frac{7}{30}$ = 84£. Ans.
6. 576.50 × $\frac{1}{4}$ = 144.125£. = 144£. 2s. 6d. Ans.
7. 1245.937 × $\frac{25}{121}$ = 257.425£. = 257£. 8s. 6d. Ans.

1. (Art. **260**, p. **261.**) $.75 × 123 = $92.25 Ans.
2. $27.90 ÷ 186 = 150 francs, Ans.
3. $0.69 × 121 = $83.49 Ans.
4. 165.20 ÷ 40 = 413 florins, Ans.
5. $1.48 × 216 = 319.68 Ans.
6. 5137.90 ÷ 10 = 51379 reals plate, Ans.

1. (Art. **263**, p. **262.**) 1 — .015 = .985; 452 × .985 = $445.22 Ans.
2. $1164 × 1.01 = 1175.64 Ans.
3. 1 — 0.025 = 0.975; $400 × 0.975 = $3900 Ans.
4. $\frac{1}{8}$ of 1 per cent = 0.00625; 1 — 0.00625 = 0.99375; $450 × 0.99375 = 447.18\frac{3}{4}$ Ans.
5. $\frac{1}{8}$ of 1 per cent = 0.00125; 1 + .00125 = 1.00125; $2517.70 × 1.00125 = $2520.84+ Ans.

2. (Art. **266**, p. **264.**) 1£. + .085£. = 1.085£.; 1085 × $\frac{4.80}{9}$ = 4.82\frac{2}{3}$; 4.82$\frac{2}{3}$ × 572.5 = 2760.72\frac{2}{3}$ Ans.
3. 1200£. × 1.0925 = 1311£.; 1311 × $\frac{4.80}{9}$ = 5826.66\frac{2}{3}$ Ans.

2. (Art. **267**, p. **265.**) 1£. + .085£. = 1.085£.; 1.085 × $\frac{4.80}{9}$ = 4.82\frac{2}{3}$; 1640 ÷ 4.82$\frac{2}{3}$ = 340£. 1s. 10d. Ans.
3. 1£. + .10£. = £1.10; 1.10 × $\frac{4.80}{9}$ = 4.96\frac{8}{9}$; 500 ÷ 4.96$\frac{8}{9}$ = 102£. 5s. 5d. Ans.

1. (Art. **269**, p. **265.**) 2380 ÷ 5.15 = $462.13+ Ans.
2. 30000 ÷ 5.175 = $5797.10+ Ans.
3. 62500 ÷ 5.12 = $12207.03+ Ans.

1. (Art. **270**, p. **266.**) 2500 × 5.12 = 12800 francs, Ans.
2. 700 × 5.13 = 3591 francs, Ans.
3. 675 × 5.16 = 3483 francs, Ans.

DUODECIMALS.

(ART. **272**, p. **267**.)

(1.)			(2.)				(3.)			(4.)				
ft.	′	″	ft.	′	″	‴	ft.	′	″	ft.	′	″	‴	⁗
12	6	9	182	11	2	4	204	7	9	397	9	6	11	7
14	7	8	127	7	8	11	114	10	6	201	11	7	8	10
165	11	10	291	5	11	10	89	9	3	195	9	11	2	9
193	2	3	602	0	11	1								

(ART. **274**, p. **268**.)

(2.)			(3.)		
ft.	′		ft.	′	
8	3		12	9	
7	9		9	11	
57	9		114	9	
6	2	3	11	8	3
63	11	3	126	5	3

(4.)

$18 + 10 \times 2 \times 16\frac{1}{2} = 924$ft., distance round the garden; 2ft. + 1ft. 6in. = 3ft. 6in., width of new ditch; 3ft. + 1ft. = 4ft., depth of new ditch; 3ft. 6in. × 4 = 14ft.; 924ft. + 14ft. = 938ft., length of the new ditch; 3ft. 6in. × 4 × 938 = 13132, contents of the new ditch. As the ditch is 2ft. wide, there must be added 2ft. × 4 = 8ft. to the distance round the garden, to obtain the entire length of the ditch, 924ft. + 8ft. = 932ft.; 932ft. × 3 × 2 = 5592 cubic feet, in the old ditch; 13132ft. − 5592ft. = 7540 cubic feet, Ans.

(5.)

ft.	ft.	in.	ft.	in.	ft.
12	6	6	5	6	12
11	2	6	3	6	11
23	13	0	16	6	23
2	3	3	2	9	2
46	16	3	19	3	46
$7\frac{1}{2}$	2		3		5
322	32	6	57	9	41 0
23			32	6	8
9)345			27	4	27 4
$38\frac{1}{3}$			9)117	7	
$13\frac{7}{108}$			$13\frac{7}{108}$		

$25\frac{29}{108}$yd. Ans.

(ART. 275, p. 269.)

2. 1ft. 0)22ft. 0(12ft. 8in. Ans.
21 0
1 2 0
1 2 0

3. $17 \times 128 = 9600$ft.

256ft. 0
4 6
1024 0
128 0
1152 0)9600ft. 0(8ft. 4in. Ans.
9216
384 0
384 0

INVOLUTION.

(ART. 277, p. 270.)

1. $6 \times 6 = 36$ Ans.
2. $5 \times 5 \times 5 = 125$ Ans.
3. $4 \times 4 \times 4 \times 4 \times 4 \times 4 =$ 4096 Ans.
4. $\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = \frac{1}{81}$ Ans.
5. $\frac{11}{3} \times \frac{11}{3} \times \frac{11}{3} \times \frac{11}{3} \times \frac{11}{3} = 16105\frac{1}{243} = 662\frac{185}{243}$ Ans.
6. $.25 \times .25 \times .25 = .015625$ Ans.
7. 17 Ans.

2. (ART. 278, p. 271.) $\overset{1}{5}, \overset{2}{25}, \overset{3}{125}$; $\overset{3}{125} + \overset{2}{25} \times \overset{2}{25} = \overset{7}{78125}$

3. $\overset{1}{6}, \overset{2}{36}, \overset{3}{216}$; $\overset{3}{216} + \overset{3}{216} \times \overset{3}{216} = \overset{9}{10077696}$ Ans. [Ans.

4. $\overset{1}{7}, \overset{2}{49}, \overset{3}{343}, \overset{4}{2401}$; $\overset{4}{2401} + \overset{3}{343} \times \overset{3}{343} + \overset{2}{49} = \overset{12}{13841287201}$

5. $\overset{1}{8}, \overset{2}{64}, \overset{3}{512}$; $\overset{3}{512} + \overset{3}{512} \times \overset{2}{64} = \overset{8}{16777216}$ Ans. [Ans.

6. $\overset{1}{4}, \overset{2}{16}, \overset{3}{64}, \overset{4}{256}, \overset{5}{1024}; \overset{5}{1024} \times \overset{5}{1024} = \overset{10}{1048576} \times \overset{10}{1048576} = \overset{20}{1099511627776}$ Ans.

7. $\overset{1}{3}, \overset{2}{9}, \overset{3}{27}, \overset{4}{81}, \overset{5}{243}, \overset{6}{729}, \overset{7}{2187}, \overset{8}{6561}, \overset{9}{19683}, \overset{10}{59049}; \overset{10}{59049} \times \overset{10}{59049} \times \overset{10}{59049} = \overset{30}{205891132094649}$ Ans.

EXTRACTION OF THE SQUARE ROOT.

(ART. **281**, p. **275**.)

(3.)

5i6961(719
49
141)269
141
1429)12861
12861

(4.)

18232 9(427
16
82)223
164
847)5929
5929

(5.)

23804641(4879
16
88)780
704
967)7646
6769
9749)87741
87741

(6.)

106732 89(3267
9
62)167
124
646)4332
3876
6527)45689
45689

(7.)

208940 41(4571
16
85)489
425
907)6440
6349
9141)9141
9141

(8.)

4 20 25(205
4
405)2025
2025

(9.)

$$\begin{array}{l} \dot{1}0\dot{1}4\dot{0}4\dot{9}(1007 \\ 1 \\ \hline 2007)014049 \\ \quad 014049 \\ \quad \overline{} \end{array}$$

(10.)

$$\begin{array}{l} \dot{5}3\dot{8}(23.194+ \\ 4 \\ \hline 43)138 \\ \quad 129 \\ \quad \overline{} \\ 461)900 \\ \quad 461 \\ \quad \overline{} \\ 4629)43900 \\ \quad 41661 \\ \quad \overline{} \\ 46384)223900 \\ \quad 185536 \\ \quad \overline{} \\ \quad 38364 \end{array}$$

(11.)

$$\begin{array}{l} 7\dot{1}(8.426+ \\ 64 \\ \hline 164)700 \\ \quad 656 \\ \quad \overline{} \\ 1682)4400 \\ \quad 3364 \\ \quad \overline{} \\ 16846)103600 \\ \quad 101076 \\ \quad \overline{} \\ \quad 2524 \end{array}$$

(12.)

$$\begin{array}{l} \dot{7}(2.645+ \\ 4 \\ \hline 46)300 \\ \quad 276 \\ \quad \overline{} \\ 524)2400 \\ \quad 2096 \\ \quad \overline{} \\ 5285)30400 \\ \quad 26425 \\ \quad \overline{} \\ \quad 3975 \end{array}$$

(13.)

$$\begin{array}{l} .1\dot{0}2\dot{4}(.32 \\ 9 \\ \hline 62)124 \\ \quad 124 \\ \quad \overline{} \end{array}$$

(14.)

$$\begin{array}{l} .3\dot{3}6\dot{4}(.58 \\ 25 \\ \hline 108)864 \\ \quad 864 \\ \quad \overline{} \end{array}$$

(15.)

$$\begin{array}{l} .8\dot{9}5\dot{0}(.946+ \\ 81 \\ \hline 184)850 \\ \quad 736 \\ \quad \overline{} \\ 1886)11400 \\ \quad 11316 \\ \quad \overline{} \\ \quad 84 \end{array}$$

(16.)

$$\begin{array}{l} .1\dot{2}0\dot{4}0\dot{9}(.347 \\ 9 \\ \hline 64)304 \\ \quad 256 \\ \quad \overline{} \\ 687)4809 \\ \quad 4809 \\ \quad \overline{} \end{array}$$

(17.)

```
      6̇1̇7̇23̇02̇0.96̇(7856.4
      49
148)1272
      1184
 1565)8830
       7825
15706)100520
        94236
 157124)628496
         628496
```

(18.)

```
      9̇75̇4.6̇04̇23̇71̇6(98.7654
      81
188)1654
     1504
1967)15060
      13769
19746)129142
       118476
197525)1066637
         987625
 1975304)7901216
          7901216
```

(Art. 282, p. 275.)

(1.) $\sqrt{\frac{49}{529}}$

```
49̇(7
49

5̇29̇(23
 4
43)129
   129
```

$\frac{7}{23}$ Ans.

(2.) $\sqrt{\frac{196}{625}}$

```
1̇96̇(14
1
24)96
   96

6̇25̇(25
 4
45)225
   225
```

$\frac{14}{25}$ Ans.

(3.) $\sqrt{\frac{3721}{7569}}$

```
 3̇72̇1(61
 36
121)121
    121

7̇56̇9(87
 64
167)1169
    1169
```

$\frac{61}{87}$ Ans.

(4.) $\sqrt{\frac{1849}{12769}}$

```
1̇84̇9(43
16
83)249
   249

1̇27̇69̇(113
1
21)27
   21
223)669
    669
```

$\frac{43}{113}$ Ans.

(5.)

$60\frac{1}{16} = \frac{961}{16}$

$\dot{9}6\dot{1}(31$

9

61)61

61

$1\dot{6}(4$

16

$\frac{31}{4} = 7\frac{3}{4}$ Ans.

(6.)

$28\frac{57}{64} = \frac{1849}{64}$

$1\dot{8}\dot{4}\dot{9}(43$

16

83)249

249

$6\dot{4}(8$

64

$\frac{43}{8} = 5\frac{3}{8}$ Ans.

(7.)

$47\frac{17}{64} = \frac{3025}{64}$

$30\dot{2}\dot{5}(55$

25

105)525

525

$6\dot{4}(8$

64

$\frac{55}{8} = 6\frac{7}{8}$.

(8.)

$\frac{42}{57} = .7\dot{3}6\dot{8}4\dot{2}+(.858+$

64

165)968

825

1708)14342

13664

678

(9.)

$83\frac{3}{7} = 8\dot{3}.6\dot{6}6\dot{6}+(9.14+$

81

181)266

181

1824)8566

7296

1270

(10.)

$121\frac{17}{18} = \dot{1}2\dot{1}.9\dot{4}4\dot{4}4\dot{4}+(11.042+$

1

21)21

21

2204)9444

8816

22082)62844

44164

18680

(11.)

$\frac{339\frac{3}{7}}{462} = \frac{2376}{3234} = \frac{36}{49}$; $\sqrt{\frac{36}{49}} = \frac{6}{7}$ Ans

(12.)

$\frac{76\frac{12}{13}}{1557\frac{9}{13}} = \frac{1000}{20250} = \frac{4}{81}$; $\sqrt{\frac{4}{81}} = \frac{2}{9}$.

APPLICATION OF THE SQUARE ROOT.

(ART. **283**, p. **276.**)

1. $\sqrt{226576} = 476$ Ans.
2. 640 acres = 102400 rods; $\sqrt{102400} = 320$ rods, Ans.
3. $125 \times 53 = 6625$rd.; $62\frac{1}{2} \times 34 = 2125$rd.; $37 \times 160 = 5920$rd.; $6625 + 2125 + 5920 = 14670$rd.; $\sqrt{14670} = 121.11+$ rods, Ans.
4. $242 \times 242 = 58564$ feet, area of the first lot; $58564 \times 9 = 527066$; $\sqrt{527076} = 726$ feet, Ans.
5. 124A. $\times 160 = 19840$ rods, area of the former pasture; 4 : 5 : : 19840 : 24800, area of the latter; $\sqrt{24800} = 157.48+$rd. Ans.
6. 2 : 3 : : 216 : 324; $\sqrt{324} = 18$ trees in length; 3 : 2 : : 216 : 144; $\sqrt{144} = 12$ trees in breadth; $18 - 1 = 17$; $17 \times 25 = 425$ft.; $12 - 1 = 11$; $11 \times 25 = 275$ft.; $425 \times 275 = 116875$ sq. ft. Ans.

1. (ART. **288**, p. **277.**) $40 \times 40 = 1600$; $9 \times 9 = 81$; $1600 + 81 = 1681$; $\sqrt{1681} = 41$ft. Ans.
2. $360 \times 360 = 129600$; $450 \times 450 = 202500$; $129600 + 202500 = 332100$; $\sqrt{332100} = 576.2+$ miles, Ans.
3. $60 \times 60 = 3600$ft.; $36 \times 36 = 1296$ft.; $3600 - 1296 = 2304$ft.; $\sqrt{2304} = 48$ feet, Ans.
4. $120 \times 120 = 14400$ft.; $50 \times 50 = 2500$ft.; $14400 - 2500 = 11900$ft.; $\sqrt{11900} = 109.08+$ feet, Ans.
5. $160 + 20 = 180$; $180 \times 180 = 32400$; $500 \times 500 = 250000$; $250000 - 32400 = 217600$; $\sqrt{217600} = 466.47+$; $466.47+ - 100 = 366.47+$ feet, Ans.
6. $110 + 90 = 200$; $300 \times 300 = 90000$; $200 \times 200 = 40000$; $90000 - 40000 = 50000$; $\sqrt{50000} = 223.6+$ft.; $223.6+ - 160 = 63.6+$ feet, Ans.
7. $60 \times 60 = 3600$; $80 \times 80 = 6400$; $3600 + 6400 = 10000$; $\sqrt{10000} = 100$; $70 \times 70 = 4900$; $4900 + 6400 = 11300$; $\sqrt{11300} = 106.3+$; $90 \times 90 = 8100$; $8100 + 4900 = 13000$; $\sqrt{13000} = 114.01+$; $8100 + 3600$

$= 11700$; $\sqrt{11700} = 108.16+$; $100 + 106.3 + 114.01 + 108.16 = 428.47+$ rods, Ans.

8. $24 \times 24 = 576$ft.; $18 \times 18 = 324$ft.; $12 \times 12 = 144$; $576 + 324 + 144 = 1044$ft.; $\sqrt{1044} = 32.3+$ feet, Ans.

2. (ART. **292**, p. **279**.) $2 : 1 :: 16^2 : 128$; $\sqrt{128} = 11.31+$ feet, Ans.
3. $1 : 3 :: 11^2 : 363$; $\sqrt{363} = 19.05+$ rods, Ans.
4. $28.3 : 42.5 :: 6^2 : 54.06+$; $\sqrt{54.06+} = 7.35+$ feet, Ans.
5. $2000 : 4000 :: 3^2 : 18$; $\sqrt{18} = 4.24+$ inches, Ans.
6. $1000 : 5000 :: 4^2 : 80$; $\sqrt{80} = 8.94+$ inches, Ans.
7. $12^2 : 8^2 :: 72 : 32$ rods, Ans.
8. $45^2 : 15^2 :: 950 : 105.55+$ square rods, Ans.
9. $6^2 : 9^2 :: 1.178+ : 2.65+$ feet, Ans.
10. $3^2 : 2^2 :: 20\frac{1}{4} : 9$ minutes, Ans.
11. $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$; $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$; $\frac{9}{16} - \frac{1}{9} = \frac{65}{144}$; $\frac{65}{144} : \frac{9}{16} :: 50 : 62\frac{4}{13}$ minutes, Ans.

1. (ART. **293**, p. **280**.) $12^2 = 144$; $144 \div 2 = 72$; $\sqrt{72} = 8.48+$ feet, Ans.
2. $30^2 = 900$; $900 \div 2 = 450$; $\sqrt{450} = 21.2+$ inches square, Ans.
3. $1.5 \times 1.5 = 2.25$; $2.25 \div 2 = 1.1250$; $\sqrt{1.1250} = 1.06+$ inches, Ans.

EXTRACTION OF THE CUBE ROOT.

(ART. **295**, p. **284**.)

(2.)

$\dot{7}4\dot{0}8\dot{8}(42$
64

$4^2 \times 300 = 4800)10088$

$4800 \times 2 = 9600$
$2^2 \times 30 \times 4 = 480$
$2 \times 2 \times 2 = 8$
10088

(3.)

$18\dot{5}1\dot{9}\dot{3}(57$
125

$5^2 \times 300 = 7500)60193$

$7500 \times 7 = 52500$
$7^2 \times 30 \times 5 = 7350$
$7 \times 7 \times 7 = 343$
60193

(4.)

$$\dot{8}0\dot{6}21\dot{5}68(432$$
$$64$$
$$4^2 \times 300 = 4800)16621$$

$$4800 \times 3 = 14400$$
$$3^2 \times 30 \times 4 = 1080$$
$$3 \times 3 \times 3 = 27$$
$$15507$$
$$43^2 \times 300 = 554700)1114568$$

$$554700 \times 2 = 1109400$$
$$2^2 \times 30 \times 43 = 5160$$
$$2 \times 2 \times 2 = 8$$
$$1114568$$

(5.)

$$17\dot{6}55\dot{8}48\dot{1}(561$$
$$125$$
$$5^2 \times 300 = 7500)51558$$

$$7500 \times 6 = 45000$$
$$6^2 \times 30 \times 5 = 5400$$
$$6 \times 6 \times 6 = 216$$
$$50616$$
$$56^2 \times 300 = 940800)942481$$

$$940800 \times 1 = 940800$$
$$1^2 \times 30 \times 56 = 1680$$
$$1 \times 1 \times 1 = 1$$
$$942481$$

(6.)

$$25\dot{7}25\dot{9}45\dot{6}(636$$
$$216$$
$$6^2 \times 300 = 10800)41259$$

$$10800 \times 3 = 32400$$
$$3^2 \times 30 \times 6 = 1620$$
$$3 \times 3 \times 3 = 27$$
$$34047$$
$$63^2 \times 300 = 1190700)7212456$$

$$1190700 \times 6 = 7144200$$
$$6^2 \times 30 \times 63 = 68040$$
$$6 \times 6 \times 6 = 216$$
$$7212456$$

(7.)

$$\dot{1}86\dot{0}86\dot{7}(123$$
$$1$$
$$1^2 \times 300 = 300)860$$

$$300 \times 2 = 600$$
$$2^2 \times 30 \times 1 = 120$$
$$2 \times 2 \times 2 = 8$$
$$728$$
$$12^2 \times 300 = 43200)132867$$

$$43200 \times 3 = 129600$$
$$3^2 \times 30 \times 12 = 3240$$
$$3 \times 3 \times 3 = 27$$
$$132867$$

(8.)

$$\dot{1}87\dot{9}0\dot{8}0\dot{9}0\dot{4}(1234$$

$$1$$

$$1^2 \times 300 = 300)879$$

$$300 \times 2 = 600$$
$$2^2 \times 30 \times 1 = 120$$
$$2 \times 2 \times 2 = 8$$
$$728$$

$$12^2 \times 300 = 43200)151080$$

$$43200 \times 3 = 129600$$
$$3^2 \times 30 \times 12 = 3240$$
$$3 \times 3 \times 3 = 27$$
$$132867$$

$$123^2 \times 300 = 4538700)18213904$$

$$4538700 \times 4 = 18154800$$
$$4^2 \times 30 \times 123 = 59040$$
$$4 \times 4 \times 4 = 64$$
$$18213904$$

(9.)

$$4\dot{1}6\dot{7}3\dot{6}4\dot{8}.5\dot{6}\dot{3}(346.7$$

$$27$$

$$3^3 \times 300 = 2700)14673$$

$$2700 \times 4 = 10800$$
$$4^2 \times 30 \times 3 = 1440$$
$$4 \times 4 \times 4 = 64$$
$$12304$$

$$34^2 \times 300 = 346800)2369648$$

(Carried forward.)

(Brought forward.)

$34^2 \times 300 = 346800)2369648$

$346800 \times 6 = 2080800$
$6^2 \times 30 \times 34 = 36720$
$6 \times 6 \times 6 = 216$
2117736

$346^2 \times 300 = 35914800)251912563$

$35914800 \times 7 = 251403600$
$7^2 \times 30 \times 346 = 508620$
$7 \times 7 \times 7 = 343$
251912563

(10.)

$48\dot{3}92\dot{1}.51\dot{6}05\dot{1}(78.51$
343

$7^2 \times 300 = 14700)140921$

$14700 \times 8 = 117600$
$8^2 \times 30 \times 7 = 13440$
$8 \times 8 \times 8 = 512$
131552

$78^2 \times 300 = 1825200)9369516$

$1825200 \times 5 = 9126000$
$5^2 \times 30 \times 78 = 58500$
$5 \times 5 \times 5 = 125$
9184625

$785^2 \times 300 = 184867500)184891051$

$184867500 \times 1 = 184867500$
$1^2 \times 30 \times 785 = 23550$
$1 \times 1 \times 1 = 1$
184891051

(11.)

$$\dot{8}.14\dot{4}86\dot{5}72\dot{8}(2.012$$
$$8$$
$$20^2 \times 300 = 120000)144865$$

$$120000 \times 1 = 120000$$
$$1^2 \times 30 \times 20 = 600$$
$$1 \times 1 \times 1 = 1$$
$$120601$$
$$201^2 \times 300 = 12120300)24264728$$

$$12120300 \times 2 = 24240600$$
$$2^2 \times 30 \times 201 = 24120$$
$$2 \times 2 \times 2 = 8$$
$$24264728$$

(12.)

$$.07\dot{5}68\dot{6}96\dot{7}(.423$$
$$64$$
$$4^2 \times 300 = 4800)11686$$

$$4800 \times 2 = 9600$$
$$2^2 \times 30 \times 4 = 480$$
$$2 \times 2 \times 2 = 8$$
$$10088$$
$$42^2 \times 300 = 529200)1598967$$

$$529200 \times 3 = 1587600$$
$$3^2 \times 30 \times 42 = 11340$$
$$3 \times 3 \times 3 = 27$$
$$1598967$$

(Art. **296**, p. **285.**)

(1.)

$81\frac{5}{11} = \quad 8\dot{1}.45\dot{4}54\dot{5}45\dot{4}(4.334+$

64

$4^2 \times 300 = 4800)\overline{17454}$

$4800 \times 3 = 14400$

$3^2 \times 30 \times 4 = 1080$

$3 \times 3 \times 3 = 27$

15507

$43^2 \times 300 = 554700)\overline{1947545}$

$554700 \times 3 = 1664100$

$3^2 \times 30 \times 43 = 11610$

$3 \times 3 \times 3 = 27$

1675737

$433^2 \times 300 = 56246700)\overline{271808454}$

$56246700 \times 4 = 224986800$

$4^2 \times 30 \times 433 = 255840$

$4 \times 4 \times 4 = 64$

225242704

46565750

(2.)

$\sqrt[3]{\frac{729}{4096}} = \frac{9}{16}$ Ans.

$72\dot{9}(9$

729

$\dot{4}09\dot{6}(16$

1

$1^2 \times 300 = 300)\overline{3096}$

$300 \times 6 = 1800$

$6^2 \times 30 \times 1 = 1080$

$6 \times 6 \times 6 = 216$

3096

(3.)

$49\frac{8}{27} = \frac{1331}{27}$;

$\sqrt[3]{\frac{1331}{27}} = \frac{11}{3} = 3\frac{2}{3}$ Ans.

$\dot{1}33\dot{1}(11$

1

$1^2 \times 300 = 300)\overline{331}$

$300 \times 1 = 300$

$1^2 \times 30 \times 1 = 30$

$1 \times 1 \times 1 = 1$

331

$2\dot{7}(3$

27

(4.)

$166\frac{3}{8} = \frac{1331}{8}$;

$\sqrt[3]{\frac{1331}{8}} = \frac{11}{2} = 5\frac{1}{2}$ Ans.

```
             1̇33̇1)11    8̇(2
             1           8
             ----
1³ × 300 = 300)331
             ----
   300 × 1 = 300
 1² × 30 × 1 =  30
  1 × 1 × 1 =    1
             ----
               331
```

(5.)

$85\frac{23}{125} = \frac{10648}{125}$;

$\sqrt[3]{\frac{10648}{125}} = \frac{22}{5} = 4\frac{2}{5}$ Ans.

```
              10̇648̇)22
               8
              ----
2² × 300 = 1200)2648
              ----
  1200 × 2 = 2400
2² × 30 × 2 =  240    125̇(5
  2 × 2 × 2 =    8    125
              ----    ---
              2648
```

1. (Art. 297, p. 285.) $\sqrt[3]{2744} = 14$ feet, Ans.
2. $268\frac{4}{5} \times 8 = 2150\frac{2}{5}$ cubic inches in 1 bushel; $2150\frac{2}{5} \times 400 = 860160$ cubic inches $= 497\frac{7}{9}$ cubic feet in 400 bushels; $\sqrt[3]{497.77\dot{7}+}$ ft. $\doteq 7.92+$ ft. Ans.
3. $18 \times 15 \times 10 = 2700$ft.; $\sqrt[3]{2700}$ft. $= 13.92+$ft. Ans.

2. (Art. 302, p. 286.) $2^3 = 8 : 12^3 = 1728 :: \$6.25 : \$1350$ Ans.
3. $4^3 = 64 : 6^3 = 216 :: 50 : 168.7+$lb. Ans.
4. $16 : 8 :: 12^3 = 1728 : 864$; $\sqrt[3]{864} = 9.5+$; $12 - 9.5+ = 2.5+$in. Ans.
5. $6^3 = 216 : 7^3 = 343 :: 800 : 1270.3+$lb. Ans.
6. $1^3 : 2^3 = 8 :: 1 : 8$ cords, Ans.
7. $30^3 = 27000 : 40^3 = 64000 :: 1000 : 2370.3+$lb. Ans.
8. $6^3 = 216 : 12^3 = 1728 :: 16 : 128$ ounces, Ans.
9. $15^3 = 3375$; $3375 \times \frac{2}{3} = 2250$; $\sqrt[3]{2250} = 13.1+$ feet. Ans.

ARITHMETICAL PROGRESSION.

2. (Art. 304, p. 288.) $\frac{55 - 7}{17 - 1} = 3$ Ans.

3. $\frac{14 - 4}{15 - 1} = \frac{10}{14} = \frac{5}{7}$ Ans.

4. $\frac{17 - 9}{10 - 1} = \frac{8}{9}$ miles, Ans.

2. (ART. **305**, p. **289.**) $\$\overline{51+\$7}\times 6=\$348$ Ans.

3. $\frac{198\times 99}{2}=9801$ rods, Ans.

2. (ART. **306**, p. **290.**) $\frac{\overline{47-8}}{3}+1=14$ days, Ans.

(ART. **307**, p. **291.**)

2. $\frac{\overline{137-12}}{5}+1=26$; $\frac{\overline{137+12}\times 26}{2}=1937$ lines, Ans.

2. (ART. **308**, p. **292.**) $\overline{12-1}\times 2+7=29$ miles, Ans.

3. $\overline{10-1}\times 1\frac{1}{2}=13\frac{1}{2}$; $20\frac{1}{4}-13\frac{1}{2}=6\frac{3}{4}$ miles, Ans.

2. (ART. **310**, p. **293.**) $\overline{(6-1)\times\$15}+\$250=\$325$; $\overline{250+325}\times 3=\$1725$ Ans.

3. $\overline{(10-1)\times\$19}+\$380=\$551$; $\overline{551+380}\times 5=\$4655$ Ans.

4. $\overline{(8-1)\times\$49.50}+\$825=\$1171.50$; $\overline{1171.50+825}\times 4=\$7986$ Ans.

5. $\$100\times.08\times 2\frac{1}{2}=\$20$; $\$100\times.08\times 2=\$16$;
$\$100\times.08\times 1\frac{1}{2}=\$12$; $\$100\times.08=\$8$;
$\$100\times.04=\$4$; $\$200\times 3=\$600$;
$\$600+\$20+\$16+\$12+\$8+\$4=\$660$ Ans.

6. $\overline{(8-1)\times\$42}+\$700=\$994$; $\overline{994+700}\times 4=\$6776$; $\$6776-\$100=\$6676$ Ans.

7. $\overline{(12-1)\times\$0.50}+\$50=\$55.50$; $\overline{55.50+50}\times 6=\$633$ Ans.

GEOMETRICAL PROGRESSION.

2. (ART. **312**, p. **295.**) $5^6=15625$; $15625\times 4=62500$ Ans.

3. $\frac{1}{4}^6=\frac{1}{4096}$; $\frac{1}{4096}\times 28672=\frac{28672}{4096}=7$ Ans.

4. $4^7=16384$; $16384\times 5=81920$ Ans.

5. $20^4=160000$; $160000\times 10=1600000$ Ans.

6. $1.06^5=1.3382255776$; $1.3382255776\times 30=40.146767328$ Ans.

7. $1.06^5 = 1.3382255776$; $1.3382255776 \times \$\,1728 = \$\,2312.453798+$ Ans.

8. $105^4 = 1.21550625$; $1.21550625 \times \$\,328.90 = \$\,399.78+$ Ans.

9. $3^{14} = 4782969$; $4782969 \times \$\,0.05 = \$\,239148.45$ Ans.

3. (Art. **313**, p. **297.**) $\frac{4^7 - 1}{4 - 1} \times 8 = 43688$ Ans.

4. $\frac{1 - \frac{3^5}{4}}{1 - \frac{3}{4}} \times 10 = \frac{781\,0}{256} = 30\frac{665}{128}$ Ans.

5. $\frac{1.06^4 - 1}{1.06 - 1} \times 18 = 78.743+$ Ans.

6. $\frac{1.05^5 - 1}{1.05 - 1} \times \$\,144 = \$\,795.6909$ Ans.

7. $1\frac{2}{3} = \frac{5}{3}$; $\frac{\frac{5^6}{3} - 1}{\frac{5}{3} - 1} = \frac{7448}{81} = \$\,91\frac{77}{81}$ Ans.

8. $\frac{6^4 - 1}{6 - 1} \times 2 = 518$ Ans.

9. $\frac{4^{10} - 1}{4 - 1} \times \$\,0.01 = \$\,3495.25$ Ans.

2. (Art. **315**, p. **299.**) $\frac{1.05^4 - 1}{1.05 - 1} \times \$\,1728 = 7447.89{,}6+$ Ans

3. $\frac{1.06^7 - 1}{1.06 - 1} \times \$\,87 = \$\,730.26{,}3+$ Ans.

4. $\frac{1.06^8 - 1}{1.06 - 1} \times \$\,500 = \$\,3487.65{,}9+$ Ans.

5. $\frac{1.06^{10} - 1}{1.06 - 1} \times \$\,96 = \$\,1265.35{,}6+$ Ans.

6. $\frac{1.06^3 - 1}{1.06 - 1} \times \$\,1000 = \$\,3183.60$ Ans.

7. $\frac{1.06^8 - 1}{1.06 - 1} \times \$\,56 = \$\,470.05{,}4+$ Ans.

8. $\frac{1.05^7 - 1}{1.05 - 1} \times \$\,25 = \$\,203.55$; $\frac{1.06^{10} - 1}{1.06 - 1} \times \$\,20 =$

$263.61,5+; $263.61,5 − $203.55 = $60.06,5+, William receives more than Samuel, Ans

9. $\frac{1.05^{14}-1}{1.05-1} \times \$10 = \$195.98,6+$ Ans.

ALLIGATION.

(2.) (ART. **318**, p. **300**.) (3.)

$0.20 × 30 = $6.00 $0.40 × 4 = $1.60
$0.25 × 40 = $10.00 $0.85 × 8 = $6.80
$0.30 × 70 = $21.00 $1.00 × 12 = $12.00
$0.40 × 80 = $32.00 $1.50 × 10 = $15.00
220gal. $69.00 34bu. $35.40

$69 ÷ 220 = 0.31\frac{4}{11}$ Ans. $35.40 ÷ 34 = 1.04\frac{2}{17}$ Ans.

(ART. **320**, p. **303**.)

(3.)

42 { 25 — 8 ; 30 — 8 ; 40 — 8 ; 50 — 17 + 12 + 2 = 31 } Ans.

(ART. **321**, p. **303**.)

(2.)

1.25 { 50 — 45 ; 60 — 25 ; 1.50 — 65 ; 1.70 — 75 } 75 : 45 : : 30 : 18bu. of oats, 75 : 25 : : 30 : 10bu. of peas, 75 : 65 : : 30 : 26bu. of beans, Ans.

(3.)

.10 × 1.25 = .12$\frac{1}{2}$
.12 × 1.25 = .15
.15 × 1.25 = .18$\frac{3}{4}$

14 { 12$\frac{1}{2}$ — 1 + 4$\frac{3}{4}$ = 5$\frac{3}{4}$; 15 — 1$\frac{1}{2}$; 18$\frac{3}{4}$ — 1$\frac{1}{2}$ } 1$\frac{1}{2}$: 5$\frac{3}{4}$: : 100 : 383$\frac{1}{3}$lb. ; 1$\frac{1}{2}$: 1$\frac{1}{2}$: : 100 : 100lb. Ans.

(ART. 322, p. 304.)

(2.)

$$1.80\left\{\begin{matrix}0.00\\2.00\\2.50\end{matrix}\right\}\quad .70+.20=\begin{matrix}.90\\1.80\\1.80\\\hline 4.50\end{matrix}$$

4.50 : .90 : : 100 : 20 bushels of chaff,
4.50 : 1.80 : : 100 : 40 bushels of wheat,
4.50 : 1.80 : : 100 : 40 bushels of rye,
} Ans.

(3.)

$.20\times 1.10=.22$
$.30\times 1.10=.33$
$25\left\{\begin{matrix}22\\33\end{matrix}\right\}\quad \begin{matrix}8\\3\\\hline 11\end{matrix}$

11 : 8 : : 80 : $58\frac{2}{11}$gal.
11 : 3 : : 80 : $21\frac{9}{11}$gal.
} Ans

(4.)

$$12\left\{\begin{matrix}10\\15\end{matrix}\right\}\quad \begin{matrix}3\\2\\\hline 5\end{matrix}$$

5 : 3 : : 60 : 36lb.
5 : 2 : : 60 : 24lb.
} Ans.

PERMUTATION.

2. (ART. 324, p. 305.) $1\times 2\times 3\times 4\times 5\times 6\times 7\times 8\times 9 = 362880$ days $= 994$ years, 70 days, Ans.
3. $12\times 11\times 10\times 9\times 8\times 7\times 6\times 5\times 4\times 3\times 2\times 1 =$ 479001600; 1 to 479001600 Ans.
4. $7\times 6\times 5\times 4\times 3\times 2\times 1 = 5040$ words, Ans.

MENSURATION OF SURFACES.

1. (ART. 328, p. 307.) $18\div 2=9$; $24\times 9=216$ft. Ans.
2. $50+60+70=180$; $180\div 2=90$; $90-50=40$; $90-60=30$; $90-70=20$; $90\times 40\times 30\times 20=2160000$; $\sqrt{2160000}=1469.69+$ rods, Ans.

1 (ART. **331**, p. **308.**) $25 \times 3 = 75$ feet, Ans.

2. $37 \times 27 = 999$ feet; $40 \times 20 = 800$ feet; $999 - 800 = 199$ feet, Ans.

3. $15 \times 12 = 180$ feet, Ans.

1. (ART. **333**, p. **309.**) $482 + 324 = 806$ft.; $806 \div 2 = 403$; $403 \times 216 = 87048$ square feet, Ans.

2. $28 + 20 = 48$in.; $48 \div 2 = 24$in. $= 2$ft.; $2 \times 22 = 44$ square feet, Ans.

1. (ART. **335**, p. **309.**) $65 \times 14\frac{1}{2} = 455$; $65 \times 18\frac{1}{2} = 585$; $455 + 585 = 1040$ square feet, Ans.

2. $125 \times 70\frac{1}{2} = 4375$; $125 \times 85\frac{1}{2} = 5312.5$; $4375 + 5312.5 = 9687.5$ square rods, Ans.

1. (ART. **338**, p. **310.**) $35 \times 5 = 175$; $175 \times 240\frac{8}{2} = 2107$ square feet, Ans.

2. $20 \times 6 = 120$; $120 \times 17\frac{32}{2} = 1039.20$ square feet, Ans.

1. (ART. **340**, p. **310.**) $3.141592 \times 50 = 157.0796+$ ft. Ans.

2. $3.141592 \times 100 = 314.15+$ rods, Ans.

1. (ART. **341**, p. **310.**) $.318309 \times 80 = 25.46+$ miles, Ans.

2. $.318309 \times 62.84 = 20+$ feet, Ans.

1. (ART. **342**, p. **311.**) $200 \times 200 \times .785398 = 31415.92$ sq. feet, Ans.

2. $400 \times 400 \times .079577 = 12732+$p. $= 79$A. 2R. 12+p. Ans.

1. (ART. **343**, p. **311.**) $40 \times .886227 = 35.44+$ rods, Ans.

2. $100 \times .282094 = 28.2+$ rods, Ans.

1. (ART. **344**, p. **312.**) $30 \times .707106 = 21.21+$ inches, Ans.

2. $100 \times .225079 = 22.5+$ rods square, Ans.

1. (ART. **346**, p. **312.**) $14 \times 10 \times .785398 = 109.95+$ square inches, Ans.

2. $8 \times 5 \times .785398 = 31.415+$ft. $= 31$ square feet, 59+ sq. inches, Ans.

MENSURATION OF SOLIDS.

1. (ART. **349**, p. **313.**) $3 \times 3 = 9$; $9 \times 15 = 135$; $3 + 3 + 3 = 9 \div 2 = 4.5$; $4.5 - 3 = 1.5$; $1.5 \times 1.5 \times 1.5 \times 4.5 = 15.1975$; $\sqrt{15.1975} = 3.895+$; $3.895 \times 2 = 7.79+$; $135 + 7.79+ = 142.79+$ square feet, Ans.

2. $9 \times 4 = 36$; $36 \times 25 = 900$; $9 \times 9 = 81$; $81 \times 2 = 162$; $900 + 162 = 1062$ square feet, Ans.

1. (ART. **350**, p. **314.**) $5 + 4 + 3 = 12$; $12 \div 2 = 6$; $6 - 5 = 1$; $6 - 4 = 2$; $6 - 3 = 3$; $1 \times 2 \times 3 \times 6 = 36$; $\sqrt{36} = 6$; $20 \times 6 = 120$ cubic feet, Ans.
2. $8 \times 8 \times 8 = 512$ cubic feet, Ans.
3. $30 \times 20 \times 10 = 6000$ cubic feet, Ans.

1. (ART. **352**, p. **314.**) $3 \times 4 = 12$; $3 \times 3 \times .079577 = .716+$; $.716 \times 2 = 1.43+$; $12 + 1.43+ = 13.43+$ square feet, Ans.
2. $2 \times 3.141592 = 6.283184$; $6.283184 \times 12 = 75.39+$ sq. feet, Ans.

1. (ART. **353**, p. **314.**) $2 \times 2 \times .785398 = 3.141592$; $3.141592 \times 8 = 25.13+$ cubic feet, Ans.
2. $5 \times 5 \times .785398 = 19.63495$; $19.63495 \times 20 = 392.69+$ feet, Ans.

1. (ART. **356**, p. **315.**) 100ft. = 1200in.; 54ft. = 648in.; $1200 \div 2 = 600$; $648 \times 600 = 388800$; $388800 \div 27 = 14400$in. = 400 yards, Ans.
2. $50 \div 2 = 25$; $25 \times 12 = 300$ square feet, Ans.

1. (ART. **357**, p. **315.**) $693 \times 693 = 480249$; $480249 \times 500 = 240124500$; $240124500 \div 3 = 80041500$ cubic feet; $80041500 \div 8 = 10005187.5$ feet; $10005187.5 \div 5280 = 1894.9$ miles, Ans.
2. $5 \times 5 \times .785398 = 19.6349$; $19.6349 \times 30 = 589.04$; $589.04 \div 3 = 196.3+$ feet, Ans.

1. (ART. **360**, p. **316.**) $8 \times 4 = 32$; $4 \times 4 = 16$; $32 + 16 = 48$; $48 \times 20 = 960$; $960 \div 2 = 480$; $8 \times 8 = 64$; $4 \times 4 = 16$; $64 + 16 = 80$; $480 + 80 = 560$ square feet, Ans.
2. $18 + 9 = 27$; $27 \times 12 = 324$; $324 \div 2 = 162$; $18 \times 18 \times .079577 = 25.78+$; $9 \times 9 \times .079577 = 6.44+$; $25.78 + 6.44 = 32.22+$; $162 + 32.22+ = 194.22+$ square feet, Ans.

1. (ART. **361**, p. **316.**) $20 \times 20 = 400$; $10 \times 10 = 100$; $400 \times 100 = 40000$; $\sqrt{40000} = 200$; $200 + 400 + 100 = 700$; $700 \times 30 = 21000$; $21000 \div 3 = 7000$ cubic feet, Ans.
2. $12 \times 12 \times .785398 = 113.097+$; $6 \times 6 \times .785398 = 28.274$; $113.097 \times 28.274 = 3197.704578$; $\sqrt{3197.704578} = 56.548+$; $56.548 + 113.097 + 28.274 = 197.919+$ in. $= 1.3744+$ ft.; $1.3744+ \times 20 = 27.488+$; $27.488+ \div 3 = 9.162+$ feet, Ans.

1. (ART. **363**, p. **317.**) $3.141592 \times 20 = 62.83+$; $62.83+ \times 20 = 1256.6+$ square inches, Ans.
2. $3.141592 \times 8000 = 25132.736$; $25132.736 \times 8000 = 201061888$ square miles, Ans.

1. (ART. **364**, p. **317.**) $20 \times 20 \times 20 \times .523598 = 4188.7+$ inches, Ans.
2. $5 \times 5 \times 5 \times .523598 = 65.44+$ cubic feet, Ans.

1. (ART. **365**, p. **317.**) $10 \times 10 = 100$; $100 \div 3 = 33.33+$; $\sqrt{33.33+} = 5.773+$ inches, Ans.
2. $30 \times 30 = 900$; $900 \div 3 = 300$; $\sqrt{300} = 17.32+$ feet, Ans.

1. (ART. **367**, p. **318.**) $20 \times 20 \times 30 \times .523598 = 6283.17+$ cubic feet, Ans.
2. $30 \times 30 \times 10 \times .523598 = 4712.38+$ cubic feet, Ans.

MENSURATION OF LUMBER AND TIMBER.

1. (ART. 369, p. 318.) $16 \times 18 = 288$in.; $288 \div 12 = 24$ feet, Ans.
2. $24 \times 30 = 720$in.; $720 \div 12 = 60$ft. Ans.

1. (ART. 370, p. 318.) $4 \times 3 \times 12 = 144$in.; $144 \div 12 = 12$ feet, Ans.
2. $10 \times 10 \times 25 = 2500$in.; $2500 \div 12 = 208\frac{1}{3}$ feet, Ans.

1. (ART. 371, p. 319.) $60 \div 4 = 15$; $15 \times 15 = 225$; $225 \times 50 = 11250$; $11250 \div 144 = 78\frac{1}{8}$ cubic feet, Ans.
2. $30 \div 4 = 7.5$; $7.5 \times 7.5 \times 30 = 1687.50$; $1687.50 \div 144 = 11.7+$ solid feet, Ans.

MISCELLANEOUS EXAMPLES.

(PAGE 319.)

1. $7\frac{1}{2} = 7\frac{4}{8}$; $7\frac{4}{8} - \frac{1}{8} = 7\frac{3}{8}$ Ans.
2. $4\frac{1}{4} = 4\frac{7}{28}$; $3\frac{3}{7} = 3\frac{8}{28}$; $4\frac{7}{28} + 3\frac{8}{28} = 7\frac{15}{28}$ Ans.
3. $5\frac{3}{7} \times 5 = 27\frac{1}{7}$; $27\frac{1}{7} - 3\frac{3}{7} = 23\frac{5}{7}$ Ans.
4. $\frac{7}{11}$m. $= \frac{7}{11} \times \frac{8}{1} = \frac{56}{11} = 5\frac{1}{11}$fur.; $\frac{1}{11}$fur. $= \frac{1}{11} \times \frac{40}{1} = 3\frac{7}{11}$rd.; $\frac{7}{11}$rd. $= \frac{7}{11} \times \frac{33}{2} = \frac{231}{22} = 10\frac{1}{2}$ft.; $\frac{1}{2} \times \frac{12}{1} = \frac{12}{2} = 6$in.; $\frac{7}{9}$fur. $= \frac{7}{9} \times \frac{40}{1} = \frac{280}{9} = 31\frac{1}{9}$rd.; $\frac{1}{9} \times \frac{33}{2} = \frac{33}{18} = 1\frac{15}{18}$ft.; $\frac{15}{18}$ft. $= \frac{15}{18} \times \frac{12}{1} = \frac{180}{18} = 10$in.

fur.	rd.	ft.	in.
5	3	10	6
	31	1	10
4	12	8	8 Ans.

5. $7 : 12 :: \frac{8}{9} : \frac{96}{63} = \frac{32}{21}$h., time Swift will travel the distance; $5 : 12 :: \frac{7}{11} : \frac{84}{55}$h., time Slow will travel the distance; $\frac{32}{21} - \frac{84}{55} = \frac{4}{1155}$h.; $\frac{4}{1155} \times \frac{60}{1} \times \frac{60}{1} = \frac{14400}{1155} = 12\frac{36}{77}$ seconds, Ans.

6. $\frac{7}{8}$T. $= \frac{7}{8} \times \frac{20}{1} = \frac{140}{8}$cwt.; $\frac{140}{8}$cwt. : $\frac{1}{4}$cwt. :: \$ 49 : $\frac{8}{100} \times \frac{1}{4} \times \frac{49}{1} =$ \$ 3.92 Ans.

7. $8 \times 4 \times 2 = 64$; $1728 \div 64 = 27$, number of bricks in a cubic foot; $40 \times 20 \times 2 = 1600$ cubic feet in the wall; $1600 \times 27 = 43200$ bricks, Ans.

8. $80 + 40 = 120$; $120 \times 2 = 240$ feet round the house; from this sum we deduct 4 feet for the corners; $240 - 4 = 236$; $236 \times 25 \times 27 = 159300$ bricks, Ans.

9. $18 \times 12 \times 144 = 31104$, number of square inches in the floor; $8 \times 8 = 64$ square inches in a tile; $31104 \div 64 = 486$ tiles, Ans.

10. 11cwt. 3qr. 19lb. = 1194lb.; 83cwt. 2qr. 11lb. = 8361lb.

$$\left.\begin{array}{l} 1194\text{lb.} : 8361\text{lb.} \\ 46\text{m.} : 96\text{m.} \end{array}\right\} :: \$\,18.25 : \$\,266.70+ \text{ Ans.}$$

11. $1.00 - .25 = .75$; \$ 24 : \$ 34 :: .75 $1.06\frac{1}{4}$; $1.06\frac{1}{4} - 1.00 = .06\frac{1}{4} = 6\frac{1}{4}$ per cent. Ans.

12. $120 - 20 = 100$ gallons remaining; \$ 30 + \$ 10 = \$ 40, price to be obtained; 100gals. : 1gal : \$ 40 : \$ 0.40 Ans.

13. \$ 128.25 $\times$ 1.03 = \$ 132.0975; \$ 132.0975 $\times$ 1.06 = \$ 140.02+ Ans.

14. $\frac{1}{3}$ of 24h. = 8h.; $\frac{1}{4}$ of 24h. = 6h.; $8 + 6 + 2 + 6 = 22$h.; 24h. — 22h. = 2 hours, Ans.

15. $\frac{1}{4}$ of 24. = 6h.; $\frac{1}{5}$ of 24h. = $4\frac{4}{5}$h.; $\frac{1}{6}$ of 24h. = 4h.; $\frac{1}{7}$ of 24h. = $3\frac{3}{7}$h.; $6 + 4\frac{4}{5} + 4 + 3\frac{3}{7} + 2 = 20\frac{8}{35}$h.; 24h.— $20\frac{8}{35}$h. = $3\frac{27}{35}$ hours, Ans.

(16.)

$$\begin{array}{ccccc} 5\frac{3}{5}\text{E.E.} & : & 71\frac{3}{4}\text{yd.} & :: & \$\,15.16 \\ \underline{5} & & \underline{4} & & \\ 28 & : & 287 & :: & 15.16 : \$\,155.39 \text{ Ans.} \end{array}$$

17. $5\frac{3}{5}$ ft. : 4ft. : : 150ft. : $107\frac{1}{7}$ feet, Ans.

18. \$ 100 : \$ 150 : : 6m. : 9m. Ans.

19. \$ 1.20 $\times$ 150 = \$ 180.00, sum paid by the polls; \$ 6045.50 — \$ 180.00 = \$ 5865.50 to be paid on valuation;

$293275 : $5865.50 :: $1.00 : $0.02 on a dollar $1.00 : $0.02 :: $3675 : $73.50; $1.20 × 4 = $4.80; $4.80 + $73.50 = $78.30 Ans.

20. $23\frac{1}{7} = \frac{165}{7}$; $16\frac{1}{2} = \frac{33}{2}$; $\frac{165}{7} \times \frac{33}{2} = \frac{5445}{14} = 388\frac{13}{14}$ft., $13\frac{4}{7} = \frac{95}{7}$; $\frac{95}{7} \times \frac{33}{2} = \frac{3135}{14} = 223\frac{13}{14}$ft.; $7\frac{5}{12} \times 2 = 14\frac{5}{6}$; $388\frac{13}{14} - 14\frac{5}{6} = 374\frac{29}{21} = \frac{7856}{21}$; $223\frac{13}{14} - 14\frac{5}{6} = 209\frac{29}{21} = \frac{4391}{21}$; $\frac{7856}{21} \times \frac{4391}{21} = \frac{34495696}{441} = 78221\frac{235}{441}$ square feet = 1A. 3R. 7p. $85\frac{1381}{1764}$ft. Ans.

21. 100 × 80 = 8000 square feet in the garden; 100 + 80 = 180; 180 × 2 = 360ft. To this we add 4 feet for each corner = 16ft.; 360 + 16 = 376ft., length of the ditch; 376 × 4 = 1504ft., superficial contents of the ditch; 8000 ÷ 1504 = $5\frac{120}{188}$ feet, depth of the ditch, Ans.

22. $15\frac{1}{2} \times 12 = 186$in.; $11\frac{1}{4} \times 12 = 135$in.; $7\frac{3}{4} \times 12 = 93$in.; 186 + 135 = 321; 321 × 2 = 642; 642 × 93 = 59706 square inches; 59706 ÷ 30 = $1990\frac{1}{5}$; $1990\frac{1}{5} \div 36 = 55\frac{17}{180}$yd. Ans.

23. $15\frac{1}{2} + 11\frac{1}{4} = 26\frac{3}{4}$; $26\frac{3}{4} \times 2 = 53\frac{1}{2} = \frac{107}{2}$; $7\frac{3}{4} = \frac{31}{4}$; $\frac{107}{2} \times \frac{31}{4} = \frac{3317}{8}$; $15\frac{1}{2} = \frac{31}{2}$; $11\frac{1}{4} = \frac{45}{4}$; $\frac{45}{4} \times \frac{31}{2} = \frac{1395}{8}$; $\frac{3317}{8} + \frac{1395}{8} = \frac{4712}{8} = 589$ square feet; 589 ÷ 9 = $65\frac{4}{9}$ square yards; $65\frac{4}{9} \times 10 = \$6.54\frac{4}{9}$ Ans.

(24.)

Y.	mo.	d.	
1852	9	29	$17.86
1850	1	9	.163
2	8	20	5358
			10716
			1786
			595
			2.91713
			· 7¼
			20.41991
			72928
			6)21.14919
			Ans. $3.52,476

25. 30 × 30 = 900; 900 ÷ 3 = 300; $\sqrt{300}$ = length of one side of the cube; $\sqrt{300} \times \sqrt{300} \times 6 = 1800$ inches, Ans.

(26.)

Principal bearing interest from Oct. 29, 1856,			$ 1000.00
Compound interest on $ 1000 from Oct. 29, 1856, to Oct. 29, 1862, 6 years,			418.51
Amount of principal to Oct. 29, 1862,			1418.51
First payment, Jan. 1, 1857,	$ 125.00		
Compound interest from Jan. 1, 1857, to Oct. 29, 1862, 5y. 9m. 28d.,	50.58		
Second payment, June 5, 1857,	316.00		
Compound interest from June 5, 1857, to Oct. 29, 1862, 5y. 4m. 24d.,	117.02		
Third payment, Sept. 25, 1857,	417.00		
Compound interest from Sept. 25, 1857, to Oct. 29, 1862, 5y. 1m. 4d.,	144.20		
Fourth payment, April 1, 1858,	100.00		
Compound interest from April 1, 1858, to Oct. 29, 1862, 4y. 6m. 28d.,	30.62		
Fifth payment, July 5, 1858,	50.00		
Compound interest from July 5, 1858, to Oct. 29, 1862, 4y. 3m. 24d.,	14.30		
Amount of indorsements,			$ 1364.72
Balance due Oct. 29, 1862,			$ 53.79

27. $40 \times 40 = 1600$; $1600 \div 3 = 533.33\frac{1}{3}$; $\sqrt{533.33\frac{1}{3}} = 23.09401$; $533.33\frac{1}{3} \times 23.09401 = 12316.8+$ Ans.

28. $32 : 4 :: 18.5^3 : 791.453125$; $\sqrt[3]{791.453125} = 9.25 = 9\frac{1}{4}$ inches wide; $32 : 4 :: 8^3 : 64$; $\sqrt[3]{64} = 4$ inches deep, Ans.

29. As $\frac{1}{3}$ of the estate was given to the wife, $\frac{2}{3}$ of the estate will remain. The eldest son has $\frac{1}{4}$ of the $\frac{2}{3} = \frac{2}{12} = \frac{1}{6}$. The wife and son will therefore have $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ of the estate. The daughter is to have $\frac{1}{6}$ of the residue; that is, $\frac{1}{6}$ of $\frac{1}{2} = \frac{1}{12}$. Therefore the wife, son, and daughter, will have $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{12} = \frac{7}{12}$; and $1\frac{2}{12} - \frac{7}{12} = \frac{5}{12}$ will remain to be divided among the other heirs. But, if $\frac{1}{12}$, the daughter's portion,

is $151.33\frac{1}{3}$, $\frac{5}{12}$, the residue, will be 5 times as much, that is, 5 times $\$151.33\frac{1}{3} = \$756.66\frac{2}{3}$ Ans.

OPERATION.

$\frac{1}{12} : \frac{5}{12} :: \$151.33\frac{1}{3} : \$756.66\frac{2}{3}$ Ans.

30. If the son receives $\frac{1}{4}$, there will remain $\frac{4}{4} - \frac{1}{4} = \frac{3}{4}$; and $\frac{1}{5}$ of $\frac{3}{4} = \frac{3}{20}$ will be the daughter's portion. The son and daughter will receive $\frac{1}{4} + \frac{3}{20} = \frac{8}{20} = \frac{2}{5}$ of the estate; there will therefore remain $\frac{5}{5} - \frac{2}{5} = \frac{3}{5}$ for the wife; and the son will receive $\frac{1}{4} - \frac{3}{20} = \frac{1}{10}$ more than the daughter; therefore, $\frac{1}{10} : \frac{3}{5} :: \$100 : \$600$, wife's portion, Ans.

31. $1.12\frac{1}{2} : 1.00 :: \$50 : \$44.44\frac{4}{9}$ Ans.

32. $\$5.00 : \$17.50 :: \frac{3}{11}\text{yd.} : \frac{21}{22}\text{yd.}$ Ans.

33. $\$128 - \$70 = \$58$; $\$58 : \$70 :: \$1000 : \$1206.89\frac{19}{29}$ Ans.

34. $\$1.21\frac{8}{3} : \$1.00 :: \$1000 : \$820.79\frac{251}{331}$ Ans.

35. $\$97.57 - \$88 = \$9.57$.

$$\left.\begin{matrix}\$88 : \$100 \\ 18\text{m.} : 12\text{m.}\end{matrix}\right\} :: \$9.57 : \$7\tfrac{1}{4}$$

$$\frac{\$9.57 \times 1000 \times 12}{18 \times 88} = \frac{114840}{15840} = 7\tfrac{1}{4} \text{ per cent. Ans.}$$

36. $\frac{3}{5}\text{gal.} : 7\frac{1}{4}\text{gal.} :: \$87 = \frac{87}{1} : \frac{31}{4} :: \frac{87}{1} = \frac{5}{3} \times \frac{31}{4} \times \frac{87}{1} = \frac{12615}{12} = \$1051.25$ Ans.

37. $18\frac{3}{7}\text{yd.} : 5\text{yd.} :: \$71 = \frac{129}{7} : \frac{5}{1} :: \frac{71}{1} = \frac{7}{129} \times \frac{5}{1} \times \frac{71}{1} = \frac{2485}{129} = \$19.26\frac{46}{129}$ Ans.

38. 18 tons 17cwt. 3qr. $= 377\frac{3}{4}\text{cwt.}$; 1cwt. : $377\frac{3}{4}\text{cwt.} :: \$9.50 : \$3588\frac{5}{8}$; $\$4.00 : \$3588\frac{5}{8} ::$ 1yd. : $897\frac{5}{32}\text{yd.}$ Ans.

39. 1bu. : 98bu. :: $\$0.45 : \$44.10$; $\$1.25 : \$44.10 ::$ 1bu. : $35\frac{7}{25}\text{bu.}$ Ans.

40. By the question, we find $\frac{1}{7}$ of the time passed from noon equal to $\frac{1}{11}$ of the time to midnight. We reduce these fractions to a common denominator, $\frac{1}{7}$ and $\frac{1}{11} = \frac{11}{77}$ and $\frac{7}{77}$. When fractions are reduced to a common denominator, their value is as their numerators. Therefore 11 will represent the time

passed from noon, and 7 the time to midnight, and $11 + 7 = 18$ will represent 12 hours; therefore 7 : 18 : : 12h. : 4h. 40m. time from noon, Ans.

41. $20000 \times 4 \times 40 \times 272\frac{1}{4} \times 144 \times 3 = 376358400000$ cubic inches; $376358400000 \div 282 = 1334604255\frac{45}{141}$ gallons; $1334604255\frac{45}{141} \div 100 = 13346042$hhd. 55gal., $\frac{45}{141}$gal. = 1qt. 0pt. $2\frac{19}{47}$gi. Ans.

42. 1° : 71° 4′ : : 4m. : 4h. 44m. 16sec.; 11h. 16m. 0sec. 4h. 44m. 16sec. = 6h. 31m. 44sec. Ans.

(43.)

18° 24′ E.
67° 21′ W.

1° : 85° 45′ : : 4m.

60 60
60 5145
4
60)20580
60)343m.
5h. 43m.

Note.—To perform this question, we are obliged to add 12 hours to the minuend, and it brings the time to the evening of the previous day.

h.	m.	
2	36	A. M.
5	43	
8	53	P. M. Ans.

(44.)

h.	m.
12	0
11	36

4m. : 24m. : : 1°

1
4)24(6°
24

16° 18′ W.
6 0
10 18 W.

45. $3000 \times 5280 = 15840000$; $15840000 \div 1142 = 13870+$ seconds; $13870 \div 60 = 231$m. 10sec.; $231 \div 60 = 3$h. 51m.; 3h. 51m. 10+sec. Ans.

46. $1142 \times 10 = 11420$; $11420 \div 5280 = 2$m. 860ft. Ans.

47. $20 - 15 = 5$: 15 : : 10 : 30 cents, Ans.

48. $12\frac{1}{2} - 10 = 2\frac{1}{2}$; 10 : $2\frac{1}{2}$: : 1.00 : .25 per cent.; 19 — 15 = 4; 15 : 4 : : 1.00 : $.26\frac{2}{3}$ per cent.; $.26\frac{2}{3} - .25 = 1\frac{2}{3}$ per cent., which Y makes more than Q.

49. From Sept. 25 to Jan. 1 are 97 days = 139680 minutes. From 23 minutes past 3 A. M. to midnight is 20h. 37m. = 1237 minutes. From Jan. 1, 1787, to Jan. 1, 1844, are 57 years = 365 × 57 × 24 × 60 = 29959200 minutes. From Jan. 1, 1844, to July 4, 1844, are 185 days = 185 × 24 × 60 = 266400 minutes. From Jan. 1, 1787, to Jan. 1, 1844, are 13 leap years; we have, therefore, to add the number of minutes in 13 days; 13 × 24 × 60 = 18720 minutes. To these we add the minutes from 30 minutes past 5 A. M. to midnight = 1050 minutes.

NOTE. — We have reckoned but 13 leap years from Jan. 1, 1787, to Jan. 1, 1844, because 1800 was *not* a leap year.

	139680
	1237
	29959200
	266400
	18720
	1050
Ans.	30386287 minutes

(50.)

	S.	°	′	″
	3	14	26	14
	8	19	43	28
Ans.	6	24	42	46

NOTE. — As the moon is east of the star, and is also moving eastward in her orbit, we must add 12 signs to the minuend.

(51.)

A.	R.	p.	ft.
3	1	23	200
1	2	37	

We first reduce the 200 feet in the minuend to yards and feet; 200 ÷ 9 = 22yd. 2ft.

A.	R.	p.	yd.	ft.	in.
3	1	23	22	2	0
1	2	37	30	8	0
1	2	25	$21\frac{1}{4}$	3	0
			$\frac{1}{4}$ =	2	36
1	2	25	21	5	36

(52.)

$\frac{5}{9} \div \frac{3}{4} = \frac{5}{9} \times \frac{4}{3} = \frac{20}{27}$ Ans.

(53.)

£.	s.	d.	qr.
1	19	11	3
1	19	11	3
1	19	11	3
1	17	11	$3\frac{1}{20}$
	1	9	$3\frac{223}{240}$
		1	$1\frac{587}{660}$
Ans. 3	19	11	$0\frac{1}{960}$

NOTE.—The first product is obtained by multiplying the multiplicand by 1, the second product by multiplying it by $\frac{19}{20}$, the third product by multiplying by $\frac{11}{240}$, and the fourth product by multiplying by $\frac{8}{960}$.

SECOND OPERATION.

1£. 19s. 11d. 3far. = 1919far.; 1919 × 1919 = 3682561far.; 3682561 ÷ 960 = 3836far. and $\frac{1}{960}$far.; 3836 ÷ 4 = 959d.; 959 ÷ 12 = 79s. and 11d.; 79 ÷ 20 = 3£. and 19s.

Ans. 3£. 19s. 11d. $\frac{1}{960}$far.

54. 1.00 — .40 = .60; .60 : 1.00 :: \$ 68.75 : \$ 114.58$\frac{1}{3}$ Ans.

55. \$ 134.40 — \$ 120 = \$ 14.40; \$ 120 : \$ 14.40 :: 1.00 : .12, or 12 per cent. Ans.

56. \$ 3600 + \$ 4200 + \$ 2200 = \$ 10000; \$ 15000 × .15 = \$ 2250; \$ 15000 — \$ 2250 = \$ 12750; \$ 12750 — \$ 10000 = \$ 2750; \$ 10000 : \$ 36000 :: \$ 2750 : \$ 990, Emerson's gain; \$ 10000 : \$ 4200 :: \$ 2750 : \$ 1155, Bailey' gain; \$ 10000 : \$ 2200 :: \$ 2750 : \$ 605, Curtis' gain.

57. $3\frac{1}{2}$in. × 2 = 7in.; 4ft. 9in. = 57in.; 3ft. 7in. = 43in.; 2ft. 11in. = 35in.; 43 × 2 = 86; 43 — 7 = 36; 35 — 7 = 28; 86 × 57 = 4902; 28 × 2 = 56; 56 × 57 = 3192; 36 × 28 × 2 = 2016; 4902 + 3192 + 2016 = 10110; 10110 ÷ 144 = $70\frac{5}{24}$ square feet; 57 — 7 = 50; 43 — 7 = 36; 35 — 7 = 28; 50 × 36 × 28 = 50400; 50400 ÷ 1728 = $29\frac{1}{6}$ cubic feet, Ans.

58. 64 × 2 = 128ft.; 32 × 2 = 64ft. From 64ft. we subtract four times the thickness of the wall; 1ft. 4in. × 4 = 5ft. 4in.; 64ft. — 5ft. 4in. = 58ft. 8in.; 128ft. + 58ft. 8in. = 186ft. 8in. = length of the wall of the house.

ft.	in.
186	8
	4
746	8
	7
3)5226	8
1742	2 8
6968	10 8
765	11 1 4
6202	11 6 8
12	
74435	
12	
893226	
12	
10718720	

ft.	in.
7	4
	3
22	0
	3 8
66	0
14	8
80	8

ft.	in.
2	8
5	8
13	4
1	9 4
15	1 4
	4
60	5 4
	4
241	9 4
80	8
252	
3)574	5 4
191	5 9 4
765	11 1 4

ft.	in.
3	8
6	4
18	32
14	2
72	64 cubic inches in a brick
18	
252	

64)10718720(167,480 bricks, Ans.

59. $\frac{1}{3}$ and $\frac{1}{4} = \frac{4}{12}$ and $\frac{3}{12}$; $\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$; $\frac{7}{12} : \frac{4}{12} :: \$1000 : \$571.42\frac{8}{7}$, Benjamin's share; $\frac{7}{12} : \frac{3}{12} :: \$1000 : \$428.57\frac{1}{7}$, Samuel's share.

60. As Bailey occupied the whole house the first four months, he must pay $\frac{1}{3}$ of $\$100 = \$33\frac{1}{3}$. As he occupied half of the next four months, he must pay half of $\$33\frac{1}{3} = \$16\frac{2}{3}$, and Bricket must pay the same sum, $\$16\frac{2}{3}$. For the last four months each must pay $\frac{1}{3}$ of $\$33\frac{1}{3} = \$11\frac{1}{9}$. $\$33\frac{1}{3} + \$16\frac{2}{3} + \$11\frac{1}{9} = \$61\frac{1}{9}$, Bailey's share of rent; $\$16\frac{2}{3} + \$11\frac{1}{9} = \$27\frac{7}{9}$, Bricket's share; $\$11\frac{1}{9} =$ Dana's share.

61. $42\frac{1}{4} \times 144 \times 2 = 12168$ square inches of surface. $3 \times 3 \times 2 = 18$ inches, the superficial contents of a side of two cubes, which measure 3 inches on each side. $12168 - 18 = 12150$; $12150 \div 6 = 2025$; $\sqrt{2025} = 45$; $45 + 3 = 48$ inches, Ans.

In order to understand the rationale of the above operation, the pupil will take six square pieces of board, which are of the same size. With them

let him construct a cubical box; and then, by examining it, he will find that he needs two small cubes, whose sides are equal to the thickness of the board or plank of which his box is constructed, in order to complete it. As our plank in the above question is three inches thick, the sides of each cube will be three inches, and the surface of one side will be $3 \times 3 = 9$ square inches, and of the two cubes it will be $2 \times 9 = 18$ square inches. These 18 inches, therefore, must be subtracted from the surface of the plank, thus: $12168 - 18 = 12150$. These remaining inches are the surface of the six square boards, and $\frac{1}{6}$ of these will be the surface of one board, thus: $12150 \div 6 = 2025$. The square root, therefore, of this number, will be one side of one of the boards. $\sqrt{2025} = 45$ inches. To this we must add the thickness of the plank or board, $45 + 3 = 48$ inches, Ans.

62. $1.00 - .10 = .90$; $1.00 + .16 = 1.16$; $1.16 - .90 = .26$; $.26 : 1.00 :: \$\,21.84 : \$\,84.00$, real value of the horse; $1.00 : .90 :: \$\,84.00 : \$\,75.60$, price paid, Ans.

63. $1.00 - .12 = .88$; $.88 : .100 :: \$\,4.40 : \$\,5.00$; $1.00 : 1.10 :: \$\,5.00 : \$\,5.50$, Ans.

(64.)

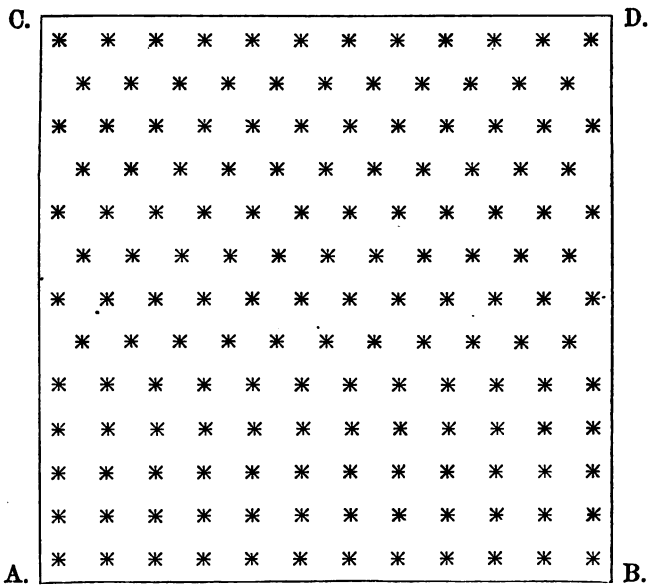
Emily,	Jane,		Abigail,	Nancy,	$ 19,000
Emily,	Jane,	Betsey,	Abigail,		19,200
	Jane,	Betsey,	Abigail,	Nancy,	20,000
Emily,		Betsey,	Abigail,	Nancy,	20,500
Emily,	Jane,	Betsey,		Nancy,	21,300
					4)$ 100,000
				Sum of the fortunes,	$ 25,000

$\$\,25,000 - \$\,19,000 = \$\,6,000$, Betsey's fortune.
$\$\,25,000 - \$\,19,200 = \$\,5,800$, Nancy's fortune.
$\$\,25,000 - \$\,20,000 = \$\,5,000$, Emily's fortune.
$\$\,25,000 - \$\,20,500 = \$\,4,500$, Jane's fortune.
$\$\,25,000 - \$\,21,300 = \$\,3,700$, Abigail's fortune.

(65.)

Our garden is 12 rods square; but, as no tree is to be set within half a rod of the fence, the trees occupy only a space 11 rods square. As our object is to plant the greatest possible number of trees, we first plant the row A B, which will contain 12 trees;

and above this row we plant 4 other rows, each tree being one rod from any other tree, and the rows one rod apart. We have now a space left which is 11 rods long and 7 rods wide. If we were to plant the remaining trees in the same manner as the others, we would have but 7 more rows, and our garden would have only $12 \times 12 = 144$ trees. But, if we set out the remainder of the trees in the quincunx order, we shall have 8 more rows, 4 of which containing 12 trees each, and 4 containing 11 trees each. Although the trees are a rod from each other, the rows are only $1^2 - .5^2 = 1 - .25 = .75$; $\sqrt{.75} = .866+$ rods apart. We have thus set out 9 rows, each containing 12 trees $= 12 \times 9 = 108$ trees; and 4 rows, each containing 11 trees $= 44$ trees. Thus we have $108 + 44 = 152$ trees, Ans.



THE END.